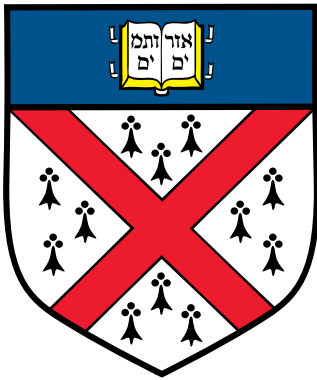


Yale College
Programs of Study
Fall and Spring Terms

2019–2020



BULLETIN OF YALE UNIVERSITY

Series 115 Number 4 June 30, 2019


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MISSION STATEMENT OF YALE COLLEGE The mission of Yale College is to seek exceptionally promising students of all backgrounds from across the nation and around the world and to educate them, through mental discipline and social experience, to develop their intellectual, moral, civic, and creative capacities to the fullest. The aim of this education is the cultivation of citizens with a rich awareness of our heritage to lead and serve in every sphere of human activity.

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KEY TO COURSE LISTINGS

AFAM	Course subjects are listed by three- or four-letter abbreviations in capitals. See the complete list of Subject Abbreviations.
MATH 112a or b	The letters “a” and “b” after a course number denote fall- and spring-term courses, respectively. A course designated “a or b” is the same course given in both terms.
Staff	Multiple course instructors are commonly listed as “Staff.” Refer to Yale Course Search (Http://courses.yale.edu) for individual section instructors.
Prerequisite: MATH 112	Prerequisites and recommendations are listed at the end of the course description.
L5, HU	Foreign language courses are designated L1 (first term of language study), L2 (second term), L3 (third term), L4 (fourth term), or L5 (beyond the fourth term). Other distributional designations are QR, WR, HU, SC, and SO, representing quantitative reasoning, writing, humanities and arts, science, and social science, respectively. See “Distributional Requirements” under “Requirements for the B.A. or B.S. Degree” (http://catalog.yale.edu/ycps/academic-regulations/requirements-for-ba-bs-degree/) in the Academic Regulations.
½ Course cr	Most courses earn one course credit per term; variations are noted.
RP	A course designated “RP” meets during the reading period. See “Reading Period and Final Examination Period” (http://catalog.yale.edu/ycps/academic-regulations/reading-period-final-examination-period/) in the Academic Regulations.
[ASTR 320]	Courses in brackets are not offered during the current year but are expected to be given in the succeeding academic year.
*HIST 012	All seminars are starred and enrollment is limited. The instructor’s permission may be required.
ITAL 310/LITR 183	A course with multiple titles, i.e., with two or more departments in the title line, counts toward the major in each department where it appears.
TR	The abbreviation “TR” denotes a literature course with readings in translation.
English: Pre-1900 Lit	Courses with department-specific designations are applied toward the requirements of certain majors. See the program descriptions of the relevant majors.
HIST 130]b, MCDB 201Lb	A capital J or L following the course number denotes a History departmental seminar or a science laboratory, respectively.
Cognitive Science Courses: ECON 159	Related courses appear in departments other than their own (e.g., ECON 159 might be listed under Cognitive Science). Such courses may count toward the major of the relating department.

BUILDING ABBREVIATIONS

AKW	Arthur K. Watson Hall	KCL	Kline Chemistry Laboratory
BASS	Bass Center for Molecular and Structural Biology	KGL	Kline Geology Laboratory
BASSLB	Bass Library	KRN	Kroon Hall
BATTEL	Battell Chapel	L	Lawrance Hall
BCMM	Boyer Center for Molecular Medicine	LC	Linsly-Chittenden Hall
BCT	Becton Engineering and Applied Science Center	LEPH	Laboratory of Epidemiology and Public Health
BF	Benjamin Franklin College	LFOP	Leitner Family Observatory and Planetarium
BK	Berkeley College	LGH	Abby and Mitch Leigh Hall
BM	Charles W. Bingham Hall	LOM	Leet Oliver Memorial Hall
BML	Brady Memorial Laboratory	LORIA	Jeffrey H. Loria Center
BR	Branford College	LUCE	Henry R. Luce Hall
BRBL	Beinecke Rare Book and Manuscript Library	LWR	Lanman-Wright Memorial Hall
BRW ₃₅	35 Broadway	MC	Morse College
C	Connecticut Hall	MEC	Malone Engineering Center
CCAM	Center for Collaborative Arts and Media	ML	Mason Laboratory
CO ₄₅₁	451 College Street	MY	Pauli Murray College
CO ₄₉₃	493 College Street	OML	Osborn Memorial Laboratories
CRB	Class of 1954 Chemistry Research Building	PC	Pierson College
CSC	Child Study Center	PH	Phelps Hall
D	Durfee Hall	PM	Peabody Museum of Natural History
DAVIES	Davies Auditorium, Becton Center	PR ₇₇	77 Prospect Street
DC	Davenport College	PWG	Payne Whitney Gymnasium
DL	Dunham Laboratory	RDH	Rudolph Hall
DOW	Dow Hall	RKZ	Rosenkranz Hall
EM	Edwin McClellan Hall	S	Sage Hall
ES	Ezra Stiles College	SA ₁₀	10 Sachem Street
ESC	Class of 1954 Environmental Science Center	SCL	Sterling Chemistry Laboratory
EVANS	Edward P. Evans Hall	SDQ	Sterling Divinity Quadrangle
F	Farnam Hall	SHM	Sterling Hall of Medicine
GH	Grace Hopper College	SLB	Sterling Law Building
GML	Greeley Memorial Laboratory	SM	Silliman College
GRN	Holcombe T. Green, Jr., Hall	SMH	Sprague Memorial Hall
HENDRIE	Hendrie Hall	SML	Sterling Memorial Library
HGS	Hall of Graduate Studies	SPL	Sloane Physics Laboratory
HLH ₁₇	17 Hillhouse Avenue	SSS	Sheffield-Sterling-Strathcona Hall
HLH ₂₈	28 Hillhouse Avenue	STOECK	Stoeckel Hall
JE	Jonathan Edwards College	SY	Saybrook College
K	Kirtland Hall	TAC	The Anlyan Center
KBT	Kline Biology Tower	TC	Trumbull College
		TD	Timothy Dwight College
		TM ₄₃₂	432 Temple Street
		UT	University Theatre
		V	Vanderbilt Hall

W	Welch Hall
WALL81	81 Wall Street
WH55	55 Whitney Avenue
WHC	Whitney Humanities Center
WL	Wright Laboratory
WL-W	Wright Laboratory West
WLH	William L. Harkness Hall
WTS	Watson Center
YCBA	Yale Center for British Art
YK212	212 York Street
YK220	220 York Street
YSB	Yale Science Building
YUAG	Yale University Art Gallery

YALE COLLEGE CALENDAR WITH PERTINENT DEADLINES

This calendar includes a partial summary of deadlines given in the Academic Regulations and in the Yale College online publication *Undergraduate Regulations*. Unless otherwise specified, references are to sections in the Academic Regulations, and deadlines fall at 5 p.m.

Fall Term 2019

Aug. 21	W	Residences open to upper-level students, 9 a.m. Online Course Selection opens
Aug. 23	F	Residences open to first-year students, 9 a.m. Required registration meetings for first-year students, 8 p.m.
Aug. 27	T	Required registration meetings for upper-level students (Class of 2022, 9 a.m.; Class of 2021, 9:45 a.m.; Class of 2020, 10:30 a.m.). Preliminary course schedules due at 11:59 p.m.
Aug. 28	W	Fall-term classes begin, 8:20 a.m.
Aug. 30	F	Friday classes do not meet; Monday classes meet instead. Deadline to complete applications for financial aid for the 2020 spring term, for students not enrolled in the 2019 fall term. See <i>Undergraduate Regulations</i> .
Sept. 2	M	Labor Day; classes do not meet.
Sept. 9	M	Final course schedules due for the Class of 2023.*
Sept. 10	T	Final course schedules due for the Classes of 2021 and 2022.*
Sept. 11	W	Final course schedules due for the Class of 2020.* All students planning to complete degree requirements at the end of the fall term must file a petition by this date. Final deadline to apply for a fall-term Leave of Absence. See Leave of Absence, Withdrawal, and Reinstatement. Withdrawal from Yale College on or before this date entitles a student to a full rebate of fall-term tuition. See <i>Undergraduate Regulations</i> .
Sept. 19	TH	Last day to withdraw from a course offered in the first half of the fall term without the course appearing on the transcript. See Withdrawal from Courses and Grades. Last day to convert from a letter grade to the Credit/D/Fail option in a course offered in the first half of the fall term. See Grades.
Sept. 21	S	Withdrawal from Yale College on or before this date entitles a student to a rebate of one-half of fall-term tuition. See <i>Undergraduate Regulations</i> .
Oct. 4	F	Last day to withdraw from a course offered in the first half of the fall term. See Withdrawal from Courses and Grades.
Oct. 14	M	Classes begin for courses offered in the second half of the fall term.
Oct. 15	T	October recess begins, 11 p.m. Deadline to apply for a spring 2020 Term Abroad. See Special Arrangements.
Oct. 21	M	Classes resume, 8:20 a.m.

Oct. 25	F	Midterm. Last day to withdraw from a fall full-term course without the course appearing on the transcript. See <i>Withdrawal from Courses and Grades</i> . Last day to convert from a letter grade to the Credit/D/Fail option in a fall full-term course. Deadline to apply for double credit in a single-credit course. See <i>Special Arrangements</i> . Withdrawal from Yale College on or before this date entitles a student to a rebate of one-quarter of the fall term's tuition. See <i>Undergraduate Regulations</i> .
Nov. 7	TH	Last day to withdraw from a course offered in the second half of the fall term without the course appearing on the transcript. See <i>Withdrawal from Courses and Grades</i> . Last day to convert from a letter grade to the Credit/D/Fail option in a course offered in the second half of the fall term. See <i>Grades</i> .
Nov. 23	S	November recess begins, 9 p.m.
Nov. 30	S	Last day to relinquish on-campus housing for the spring term without charge. See <i>Undergraduate Regulations</i> .
Dec. 2	M	Classes resume, 8:20 a.m.
Dec. 6	F	Classes end, 5:30 p.m.; reading period begins. Last day to withdraw from a fall full-term course or a course offered in the second half of the fall term. See <i>Withdrawal from Courses and Grades</i> .
Dec. 12	TH	Reading period ends, 5 p.m. Final examinations begin, 7 p.m. [†] Deadline for all course assignments, other than term papers and term projects. This deadline can be extended only by a Temporary Incomplete authorized by the student's residential college dean.
Dec. 13	F	Application for 2020 Yale Summer Session Programs Abroad opens.
Dec. 18	W	Examinations end, 5:30 p.m.; winter recess begins. Deadline for all term papers and term projects. This deadline can be extended only by a Temporary Incomplete authorized by the student's residential college dean.
Dec. 19	TH	Residences close, 12 noon.

Spring Term 2020

Jan. 8	W	Residences open, 9 a.m.
Jan. 12	SU	Required registration meetings for first-year students, 9 p.m. Application for 2020 New Haven and online Summer Session courses opens. Rolling admissions for New Haven and online courses.
Jan. 13	M	Spring-term classes begin, 8:20 a.m. Upper-level students pick up registration materials by 5 p.m. in their residential college dean's office.
Jan. 17	F	Friday classes do not meet; Monday classes meet instead.
Jan. 20	M	Martin Luther King Jr. Day; classes do not meet.
Jan. 22	W	Final course schedules due for the Class of 2023.*
Jan. 23	TH	Final course schedules due for the Classes of 2021 and 2022.*
Jan. 24	F	Final course schedules due for the Class of 2020.* Last day for students in the Class of 2020 to petition for permission to complete the requirements of two majors.

Jan. 27	M	Final deadline to apply for a spring-term Leave of Absence. See Leave of Absence, Withdrawal, and Reinstatement. Withdrawal from Yale College on or before this date entitles a student to a full rebate of spring-term tuition. See <i>Undergraduate Regulations</i> .
Feb. 4	T	Last day to withdraw from a course offered in the first half of the spring term without the course appearing on the transcript. See Withdrawal from Courses and Grades. Last day to convert from a letter grade to the Credit/D/Fail option in a course offered in the first half of the spring term. See Grades.
Feb. 6	TH	Withdrawal from Yale College on or before this date entitles a student to a rebate of one-half of spring-term tuition. See <i>Undergraduate Regulations</i> .
Feb. 13	TH	Deadline for applications for Yale Summer Session Programs Abroad.
Feb. 19	W	Last day to withdraw from a course offered in the first half of the spring term. See Withdrawal from Courses and Grades.
Feb. 27	TH	Classes begin for courses offered in the second half of the spring term.
Feb. 28	F	Deadline to apply for Non-Yale Summer Abroad.
Mar. 5	TH	Deadline to apply for a fall 2020 Term Abroad or a 2020–2021 Year Abroad.
Mar. 6	F	Midterm. Spring recess begins, 5:30 p.m. Last day to withdraw from a spring full-term course without the course appearing on the transcript. See Withdrawal from Courses and Grades. Last day to convert from a letter grade to the Credit/D/Fail option in a spring full-term course. Deadline to apply for double credit in a single-credit course. See Special Arrangements. Withdrawal from Yale College on or before this date entitles a student to a rebate of one-quarter of the spring term's tuition. See <i>Undergraduate Regulations</i> .
Mar. 23	M	Classes resume, 8:20 a.m.
Apr. 2	TH	Last day to withdraw from a course offered in the second half of the spring term without the course appearing on the transcript. See Withdrawal from Courses and Grades. Last day to convert from a letter grade to the Credit/D/Fail option in a course offered in the second half of the spring term. See Grades.
Apr. 24	F	Classes end, 5:30 p.m.; reading period begins. Last day to withdraw from a spring full-term course or a course offered in the second half of the spring term. See Withdrawal from Courses and Grades.
Apr. 30	TH	Reading period ends, 5 p.m. Final examinations begin, 7 p.m. [†] Deadline for all course assignments, other than term papers and term projects. This deadline can be extended only by a Temporary Incomplete authorized by the student's residential college dean.
May 1	F	Applications for fall-term Leaves of Absence due. See Leave of Absence, Withdrawal, and Reinstatement.
May 6	W	Examinations end, 5:30 p.m. Deadline for all term papers and term projects. This deadline can be extended only by a Temporary Incomplete authorized by the student's residential college dean.
May 7	TH	Residences close for all students except seniors, 12 noon.

May 18 M University Commencement.
May 19 T Residences close for seniors, 12 noon.

Summer Session

Courses offered during the summer are offered through Yale Summer Session. Further information is available from the Yale Summer Session office or on the website.

* Late schedules from all classes are fined. See Grades and Registration and Enrollment in Courses.

† Examinations will be held on Saturdays and Sundays, December 14 and 15; May 2 and 3.

YALE COLLEGE ADMINISTRATIVE OFFICERS

ADMINISTRATIVE OFFICERS

Peter Salovey, Ph.D., President of the University
Benjamin Polak, Ph.D., Provost of the University
Marvin Chun, Ph.D., Dean of Yale College
Tamar S. Gendler, Ph.D., Dean of the Faculty of Arts and Sciences
Jane Edwards, Ph.D., Senior Associate Dean; Dean of International and Professional Experience
Burgwell Howard, M.Ed., Senior Associate Dean; Associate Vice President of Student Engagement
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Pamela Schirmeister, Ph.D., Senior Associate Dean; Dean of Undergraduate Education
Sandy Chang, M.D., Ph.D., Associate Dean for Science and QR Education
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Jeanne Follansbee, Ph.D., Associate Dean; Dean of Yale Summer Session
George G. Levesque, Ph.D., Associate Dean; Dean of Academic Programs
Petronella Van Deusen-Scholl, Ph.D., Associate Dean for Foreign Language Education; Director of the Center for Language Study
Melanie Boyd, Ph.D., Assistant Dean of Student Affairs; Special Adviser to the Dean on Gender Issues
Matthew Makomenaw, Ph.D., Assistant Dean; Director of the Native American Cultural Center
Eileen M. Galvez, M.Ed., Assistant Dean; Director of La Casa Cultural
Alfred E. Guy, Jr., Ph.D., Assistant Dean; Director of the Yale College Writing Center
Kelly McLaughlin, M.A., Assistant Dean of Assessment; Deputy Director and Director of Study Abroad
Risë Nelson, M.A., Assistant Dean, Director of the Afro-American Cultural Center
Hannah Peck, M.Div., Assistant Dean of Student Affairs
Risa Sodi, Ph.D., Assistant Dean; Director of Advising and Special Programs
Joliana Yee, M.Ed., Assistant Dean; Director of Asian American Cultural Center
Joel Silverman, Ph.D., Director of Academic and Educational Affairs
Ksenia Sidorenko, M.Phil., Title IX Coordinator
Emily Shandley, B.A., University Registrar

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Davenport College, Ryan A. Brasseaux, Ph.D.
Timothy Dwight College, Sarah Mahurin, Ph.D.
Jonathan Edwards College, Christina Ferando, Ph.D.
Benjamin Franklin College, Jessie Royce Hill, M.S.
Grace Hopper College, David Francis, Ph.D.
Morse College, Angela Gleason, Ph.D.
Pauli Murray College, Alexander Rosas, J.D., Ph.D.
Pierson College, Riché Barnes, Ph.D.
Saybrook College, Ferentz Lafargue, Ph.D.
Silliman College, Leanna Barlow, Ph.D.
Ezra Stiles College, Nilakshi Parndigamage, J.D.
Trumbull College, Surjit Chandhoke, Ph.D.

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Margit A. Dahl, B.A., Director of Undergraduate Admissions
Scott Wallace-Juedes, B.A., Director of Undergraduate Financial Aid
Caesar Storlazzi, M.M., University Director of Financial Aid
Kerry Worsencroft, B.S., Deputy University Director of Financial Aid

FINAL EXAMINATION SCHEDULES

Rules governing the conduct of final examinations are given in Academic Regulations, section G, Reading Period and Final Examination Period.

An examination group number is assigned to every course. Examination group assignments are based on course meeting times, according to the following scheme. Hours shown are the times at which courses begin:

- | | | | |
|------|----------------------------|------|-------------------------|
| (31) | M, W, or F, 8:20 a.m. | | |
| (32) | M, W, or F, 9 or 9:25 a.m. | (22) | T or Th, 9 or 9:25 a.m. |
| (33) | M, W, or F, 10:30 a.m. | (23) | T or Th, 10:30 a.m. |
| (34) | M, W, or F, 11:35 a.m. | (24) | T or Th, 11:35 a.m. |
| (36) | M, W, or F, 1 or 1:30 p.m. | (26) | T or Th, 1 or 1:30 p.m. |
| (37) | M, W, or F, after 2 p.m. | (27) | T or Th, after 2 p.m. |

Note: With the exception of courses assigned to common examination groups, a change in class meeting time will alter the examination time.

Courses with multiple sections but a common examination are assigned to an examination group from (61) to (69). Typical assignments include (but are not limited to): (61) foreign languages; (63) introductory-level English; (64) introductory economics; (65) physics; (69) introductory mathematics.

The examination group (50) is assigned to courses whose times are published HTBA, or whose times belong to more than one of the groups listed above.

Courses in group (o) usually have no regular final examination, concluding instead with a term essay or other final exercise. Instructors of such courses may schedule a regular final examination based on the course starting time.

Final examination dates and times for 2019–2020 are:

Fall	9 a.m.	2 p.m.	7 p.m.	Spring	9 a.m.	2 p.m.	7 p.m.
12 Dec. Th			(23)	30 April Th			(63)
13 Dec. F	(63)	(61)		1 May F	(61)	(33)	
14 Dec. Sa	(31)	(26)	(22)	2 May Sa	(69)	(31)	(65)
15 Dec. Su		(33)	(69)	3 May Su		(34)	(36)
16 Dec. M	(37)	(34)	(64)	4 May M	(23)	(27)	(37)
17 Dec. Tu	(27)	(36)	(32)	5 May Tu	(32)	(24)	(64)
18 Dec. W	(65)	(24)		6 May W	(22)	(26)	

A student who in a given term elects two courses with the same examination group number will be charged \$35 for a makeup examination. (See Academic Regulations, section H, Completion of Course Work, “Postponement of Final Examinations.”)

SUBJECT ABBREVIATIONS

ACCT	Accounting	ER&M	Ethnicity, Race, and Migration
AFAM	African American Studies	EVST	Environmental Studies
AFST	African Studies	F&ES	Forestry & Environmental Studies
AKKD	Akkadian	FILM	Film and Media Studies
AMST	American Studies	FNSH	Finnish
AMTH	Applied Mathematics	FREN	French
ANTH	Anthropology	G&G	Geology and Geophysics
APHY	Applied Physics	GLBL	Global Affairs
ARBC	Arabic	GMAN	Germanic Languages and Literatures
ARCG	Archaeological Studies	GREK	Ancient Greek
ARCH	Architecture	HEBR	Hebrew
ARMN	Armenian	HGRN	Hungarian
ART	Art	HIST	History
ASL	American Sign Language	HLTH	Global Health Studies
ASTR	Astronomy	HMRT	Human Rights
BENG	Biomedical Engineering	HNDI	Hindi
BIOL	Biology	HSAR	History of Art
BNGL	Bengali	HSHM	History of Science, Medicine, and Public Health
BRST	British Studies	HUMS	Humanities
BURM	Burmese	INDN	Indonesian
CENG	Chemical Engineering	ITAL	Italian
CGSC	Cognitive Science	JAPN	Japanese
CHEM	Chemistry	JDST	Judaic Studies
CHLD	Child Study Center	KHMR	Khmer
CHNS	Chinese	KREN	Korean
CLCV	Classical Civilization	LAST	Latin American Studies
CLSS	Classics	LATN	Latin
CPAR	Computing and the Arts	LING	Linguistics
CPSC	Computer Science	LITR	Literature
CSEC	Computer Science and Economics	MATH	Mathematics
CZEC	Czech	MB&B	Molecular Biophysics and Biochemistry
DEVN	DeVane Lecture Course	MCDB	Molecular, Cellular, and Developmental Biology
DRST	Directed Studies	MENG	Mechanical Engineering
DUTC	Dutch	MGRK	Modern Greek
EALL	East Asian Languages and Literatures	MMES	Modern Middle East Studies
EAST	East Asian Studies	MTBT	Modern Tibetan
ECON	Economics	MUSI	Music
EDST	Education Studies	NAVY	Naval Science
E&EB	Ecology and Evolutionary Biology	NELC	Near Eastern Languages and Civilizations
EENG	Electrical Engineering	NSCI	Neuroscience
EGYP	Egyptian	PERS	Persian
ENAS	Engineering and Applied Science	PHIL	Philosophy
ENGL	English Language and Literature		
ENRG	Energy Studies		
ENVE	Environmental Engineering		
EP&E	Ethics, Politics, and Economics		

PHYS	Physics
PLSC	Political Science
PLSH	Polish
PNJB	Punjabi
PORT	Portuguese
PSYC	Psychology
RLST	Religious Studies
ROMN	Romanian
RSEE	Russian and East European Studies
RUSS	Russian
S&DS	Statistics and Data Science
SAST	South Asian Studies
SBCR	Bosnian-Croatian-Serbian
SCIE	Science
SKRT	Sanskrit
SLAV	Slavic Languages and Literatures
SNHL	Sinhala
SOCY	Sociology
SPAN	Spanish
SPEC	Special Divisional Major
STCY	Study of the City
SWAH	Kiswahili
TAML	Tamil
TBTN	Classical Tibetan
THST	Theater Studies
TKSH	Turkish
TWI	Twi
UKRN	Ukrainian
URBN	Urban Studies
USAF	Aerospace Studies
VIET	Vietnamese
WGSS	Women's, Gender, and Sexuality Studies
WLOF	Wolof
YORU	Yorùbá
ZULU	isiZulu

A MESSAGE FROM THE DEAN OF YALE COLLEGE

We officially call this publication *Yale College Programs of Study*, but generations of students and faculty have known it simply as the blue book. A compendium of roughly 2,000 courses to be offered in Yale College in 2019–2020, the blue book is a resource to use. Bookmark pages you wish to return to; browse the subjects that you find yourself called to. Let the blue book be your key to the renowned faculty at Yale, through whose courses you will develop the intellectual knowledge, skills, and sense of citizenship that will serve you all the days of your lives.

Of course, a listing of individual courses does not constitute an education. To help shape that education, we offer you the counsel of faculty and deans and the guiding principles of our distributional requirements, but in the end we are counting on you to explore your old passions and new interests in ways that will lead you to become cultivated citizens of the world. Our expectation is that when you leave Yale, you will not only have acquired a trained mind, broadened knowledge, and a greater sense of citizenship; you also will have come to a deeper understanding of the continuing joy of disciplined learning.

We hope that the blue book will stir you to consider courses of study that you had never before imagined and lead you deeper into intellectual worlds you already have explored. It represents the heart and soul of what the Yale faculty holds in promise for you. It comes to you with our best wishes for a successful year.

Marvin M. Chun, Ph.D.

Dean of Yale College

Richard M. Colgate Professor of Psychology; Neuroscience; Cognitive Science

I. YALE COLLEGE

The Undergraduate Curriculum

Yale College, founded in 1701, is a coeducational undergraduate institution offering instruction in the liberal arts and sciences to about 5,800 students. The College is the oldest and the largest school of the University, which also comprises the Graduate School of Arts and Sciences and ten professional schools.

Yale College offers a liberal arts education, one that aims to cultivate a broadly informed, highly disciplined intellect without specifying in advance how that intellect will be used. Such an approach to learning regards college as a phase of exploration, a place for the exercise of curiosity, and an opportunity for the discovery of new interests and abilities. The College does not seek primarily to train students in the particulars of a given career, although some students may elect to receive more of that preparation than others. Instead, its main goal is to instill knowledge and skills that students can bring to bear in whatever work they eventually choose. This philosophy of education corresponds with that expressed in the Yale Report of 1828, which draws a distinction between “expanding [the mind’s] powers, and storing it with knowledge.” Acquiring facts is important, but learning how to think critically and creatively in a variety of ways takes precedence.

To ensure that study is neither too narrowly focused nor too diffuse, the College stands behind the principle of distribution of studies as strongly as it supports the principle of concentration. It requires that study be characterized, particularly in the earlier years, by a reasonable diversity of subject matter and approach, and in the later years, by concentration in one of the major programs or departments. In addition, the College requires that all students take courses that develop certain foundational skills—writing, quantitative reasoning, and foreign language—that hold the key to opportunities in later study and later life. People who fail to develop these skills at an early stage unknowingly limit their futures. In each skill, students are required to travel some further distance from where they were in high school so that each competence matures and deepens. The best high school writer is still not the writer he or she could be; students who do not use their quantitative or foreign language skills in college commonly lose abilities they once had and can graduate knowing less than when they arrived.

In a time of increasing globalization, both academic study of the international world and firsthand experience of foreign cultures are crucial. No Yale College student can afford to remain ignorant of the forces that shape our world. Yale College urges all of its students to consider a summer, a term, or a year abroad sometime during their college careers.

A student working toward a bachelor’s degree takes four or five courses each term and normally receives the B.A. or B.S. degree after completing thirty-six term courses or their equivalent in eight terms of enrollment. To balance structure with latitude and to achieve a balance of breadth and depth, a candidate for the bachelor’s degree

is required, in completing the thirty-six term courses, to fulfill the distributional requirements described in this bulletin, as well as the requirements of a major program.

Distributional Requirements

The distributional requirements described below are intended to insure that all graduates of Yale College have an acquaintance with a broad variety of fields of inquiry and approaches to knowledge. These requirements are the only specific rules limiting the selection of courses outside a student's major program. By themselves, the distributional requirements constitute a minimal education, not a complete one. They are to be embraced as starting points, not goals.

DISTRIBUTIONAL REQUIREMENTS FOR THE BACHELOR'S DEGREE

Students must fulfill disciplinary area requirements by taking no fewer than two course credits in the humanities and arts, two in the sciences, and two in the social sciences. Students must also fulfill skills requirements by taking at least two course credits in quantitative reasoning, two course credits in writing, and courses to further their foreign language proficiency. Depending on their level of accomplishment in foreign languages at matriculation, students may fulfill this last requirement with one, two, or three courses or by certain combinations of course work and approved study abroad.

Area requirement in the humanities and arts (two course credits) Study of the humanities and arts—those subjects that explore how we chronicle and interpret the expression of human experience—cultivates an appreciation of the past and enriches our capacity to participate in the life of our times. By engaging other cultures and civilizations, both ancient and modern, students gain insight into the experiences of others while also obtaining an opportunity to critically examine their own. Through the study and practice of the arts, students analyze, create, and perform works allowing them to explore or experience firsthand the joy and discipline of artistic expression. Rigorous and systematic study of the humanities and the arts fosters tolerance for ambiguity and sophisticated analytic skills that provide essential preparation for careers in most areas of contemporary life. But independently of any specific application, study of these subjects teaches understanding and delight in the highest achievements of humanity.

Area requirement in the sciences (two course credits) Science is the study of the principles of the physical and the natural world through observation and experimentation. The theoretical inquiry, experimental analysis, and firsthand problem solving inextricably linked to scientific inquiry give rise to new modes of thought. Acquiring a broad view of what science is, what it has achieved, and what it might continue to achieve is an essential component of a college education. Close study of a science develops critical faculties that educated citizens need to evaluate natural phenomena and the opinions of experts, and to make, understand, and evaluate arguments about them. Scientific literacy teaches students to appreciate the beauty of the natural and physical worlds often hidden from casual observation but which, once revealed, lend richness to everyday life.

Area requirement in the social sciences (two course credits) Broadly conceived, the social sciences study human social behavior and networks using a variety of

methodologies and both qualitative and quantitative analysis. The disciplines in the social sciences teach us about who we are as social beings and help us appreciate the perspective of the other as well as the particularities of society. Methods in the social sciences test for connections between the familiar and the foreign, the traditional and the contemporary, the individual and the group, the predicted result and the anomalous outcome. Their theories propose explanations for the entire range of human phenomena. Study of the social sciences prepares students for lives of civic engagement and develops a nuanced sense of the world around them.

Skills requirement in foreign language (at least one course, depending on preparation) The study of languages has long been one of the distinctive and defining features of a liberal arts education and, in the world of the twenty-first century, knowledge of more than one language is increasingly important. The benefits of language study include enhanced understanding of how languages work, often resulting in heightened sophistication in the use of one's own language; unmediated access to texts otherwise available only in translation, or not at all; and the ability to recognize and cross cultural barriers.

All Yale College students are required to engage in study of a foreign language, regardless of the level of proficiency at the time of matriculation. Depending on their preparation, students take one, two, or three terms of foreign language study to fulfill the distributional requirement. Students may complete an approved study abroad program in lieu of intermediate or advanced language study at Yale. Details of the foreign language distributional requirement are listed under Distributional Requirements in the Academic Regulations.

Skills requirement in quantitative reasoning (two course credits) The application of quantitative methods are critical to many different disciplines. Mathematics and statistics are basic tools for the natural and the social sciences, and are useful in many of the humanities as well. Information technology and the rigorous dissection of logical arguments in any discipline depend on algorithms and formal logical constructs. An educated person must be able to use quantitative information to make, understand, and evaluate arguments.

Many quantitative reasoning courses are taught through the departments of Mathematics, Statistics and Data Science, Computer Science, Economics, and the academic programs in engineering. Quantitative reasoning courses may also be found in a range of other programs.

Skills requirement in writing (two course credits) The ability to write well is one of the hallmarks of a liberally educated person and is indispensable to advanced research in most disciplines. As students strengthen their writing skills, they develop intellectual practices that distinguish active from passive learners.

The English department in particular offers many courses that focus on writing clearly and cogently, and courses in other departments stress writing skills within the context of their disciplines. Hundreds of courses, spanning most academic programs, give special attention to writing. Such courses, designated WR, do not necessarily require more writing than other courses; rather, they provide more help with writing assignments. Some characteristics of WR courses include writing to discover ideas, learning from model essays, detailed feedback, and reviewing writing in small groups.

Note that credit toward the writing requirement cannot be earned in courses in creative writing (specifically poetry, fiction, and playwriting) nor in courses conducted in a language other than English.

Major Programs

All candidates for a bachelor's degree in Yale College must elect a major program. The requirements for a major are described in general terms in the sections below, and in more detail under Subjects of Instruction. Students should acquaint themselves fully with all the requirements of the major they plan to enter, considering not only the choice of courses in the current term but also the plan of their entire work in the last two or three years in college. Advising in the major is available in the departments by the director of undergraduate studies (DUS) or the DUS's designee, and students should plan a schedule of courses in their major in consultation with them. In addition, after a student has declared a major, the DUS or the DUS's designee is normally the person who signs the student's course schedule.

Students seeking the B.S. or the B.A. degree with a major in science or engineering are expected to declare their majors at the beginning of sophomore year, although a student who has completed the prerequisites may elect a science major later. Sophomores interested in majoring in science or engineering should discuss their major course of studies with the director of undergraduate studies or the adviser designated by the department. Students seeking the B.A. degree with a major in a field other than science or engineering typically declare their major by the end of the sophomore year and should do so no later than the beginning of the junior year. In the sophomore year, these students' schedules are signed by their college adviser, chosen by the student, with whom the program has been discussed.

SELECTION OF A MAJOR

In designing a program of study, the student ought to plan for depth of concentration as well as breadth of scope. To study a subject in depth can be one of the most rewarding and energizing of human experiences and can form the basis of the interests and occupations of a lifetime. Knowledge advances by specialization, and one can gain some of the excitement of discovery by pressing toward the outer limits of what is known in a particular field. Intense study of a seemingly narrow area of investigation may disclose ramifications and connections that alter perspectives on other subjects. Such study also sharpens judgment and acquaints a person with processes by which new truths can be found.

In order to gain exposure to this kind of experience, students must elect and complete a major, that is, the subject in which they will work more intensively than in any other. Yale College offers more than eighty possible majors. The department or program concerned sets the requirements for each major, which are detailed under Subjects of Instruction.

Some students will have made a tentative choice of a major before entering college. Others will have settled on a general area—for example, the natural sciences or the humanities—without being certain of the specific department or program of their major. Still others will be completely undecided. Many students who arrive with their minds made up change them after a year or two. Even students who feel certain of their

choices should keep open the possibility of a change. In selecting courses during their first two years, students should bear in mind not only the distributional requirements, but also the need for some exploration of the subjects to which they feel drawn.

THE MAJOR (B.A. OR B.S.)

A major program usually includes at least twelve term courses in the same area, progressing from introductory to advanced work, which become the focus of a student's program in the junior and senior years. Majors are offered by departments, interdepartmental programs, or interdisciplinary programs. In many departments and programs, a limited number of courses in related fields may be offered in fulfillment of the requirements for the major. Many majors have prerequisites, usually taken in the first year or sophomore year.

In all majors, the student must satisfy a senior requirement, usually a senior essay, senior project, or senior departmental examination. In an intensive major, the student must fulfill additional requirements, such as taking a prescribed seminar, tutorial, or graduate course, or completing some other project in the senior year.

SPECIAL DIVISIONAL MAJORS

A Special Divisional Major affords an alternative for the student whose academic interests cannot be met within one of the existing major programs. Such students may, with the approval of the Committee on Honors and Academic Standing, design special majors of their own in consultation with members of the faculty and in accordance with the procedures outlined under Subjects of Instruction. A Special Divisional Major may not be offered as one of two majors.

Multidisciplinary Academic Programs

Multidisciplinary Academic Programs provide opportunities for Yale College students to examine pressing social challenges from a variety of disciplinary perspectives among a community of students and faculty who have shared interests. Students from any major can apply to these programs, and faculty from across the University participate in them. Each program focuses centrally on a distinct and different set of issues, but they all share common features, including a core curriculum—beginning with a gateway course and culminating in a senior capstone project—and opportunities for practical experience that allow students to combine theory and practice, applying what they have learned in the classroom and in their research.

EDUCATION STUDIES

The Education Studies program comprises an interdisciplinary cohort of scholars who are interested in education practice, policy, and/or research. Each scholar completes electives within the Education Studies curriculum, a summer or academic-year field experience, and a senior capstone seminar and thesis-equivalent project. Education Studies Scholars also explore educational topics through symposia led by Yale faculty and advising relationships with mentors. Students may apply to the Education Studies Undergraduate Scholars program in their sophomore year. The prerequisite for applying is EDST 110. For more information, see the program website.

ENERGY STUDIES

The Energy Studies multidisciplinary academic program is designed to provide select undergraduates with the broad knowledge and skills needed for advanced studies, leadership, and success in energy-related fields. The curriculum is divided in three tracks—Energy Science and Technology, Energy and the Environment, and Energy and Society—and requires the completion of six graded term courses covering the three tracks, plus a senior capstone project. Admission to the Energy Studies Undergraduate Scholars program is by application in the fall term of sophomore year. For more information, see the program website.

GLOBAL HEALTH STUDIES

The Global Health Studies program is designed for students interested in critically and analytically engaging in global health. The program supports students in developing and balancing an appreciation for biomedical and technical issues related to diseases, and their treatment and prevention, with an understanding of the historical, social, economic, and political concerns that are implicated in how health is determined and experienced in the twenty-first century. Although most courses in global health are open to all undergraduates, students desiring greater depth in the field are encouraged to apply to become a Global Health Scholar, typically in the fall of their sophomore year. Students in the program complete an interdisciplinary course of study that includes required and elective course work across different global health competency areas. Moreover, in the summer after junior year, Global Health Scholars pursue an experiential learning project (e.g., internships with NGOs, archival research, field-based research with faculty, etc.), for which they can receive support in the form of designated funding and mentorship from a global health adviser. During their senior year, students enroll in a colloquium course in which they develop a capstone project that meaningfully integrates their experiential learning project with other skills and knowledge acquired through the GHS Program. For more information, see the program website.

HUMAN RIGHTS STUDIES

The Human Rights Studies program seeks to equip students with an academic foundation from which to engage meaningfully with human rights scholarship and practice. The program is based on an understanding that human rights constitutes a rich and interdisciplinary field of study, drawing on bodies of work in history, literature, economics, political science, philosophy, anthropology, law, and area studies. The program provides students with relevant analytical, conceptual, and practical skills; connects students to affiliated faculty and peers; supports student research projects and internship opportunities; and offers career guidance in the field. Students interested in admission to the Human Rights Studies program must apply in the fall semester of their sophomore year. For more information, see the program website.

International Experience

Experience abroad is an invaluable complement to academic training. Such experience may include course work at foreign universities, intensive language training, directed research, independent projects, internships, laboratory work, and volunteer service. Yale College provides a variety of international opportunities during term time,

summers, and post-graduation, as well as a large and growing number of fellowships to support students abroad, all of which augment students' education in a globalizing world. Students can visit the Center for International and Professional Experience to explore options for study abroad, search for international internships and careers, and seek funding for study, research, and work experiences off campus. Summer courses abroad are offered by Yale Summer Session. Students can also apply to receive transfer credit from eligible outside summer study abroad programs. To learn more, visit the Study Abroad website. Students receiving financial aid may be eligible for summer funding through the International Summer Award (ISA) program.

YEAR OR TERM ABROAD

In recognition of the special value of formal study abroad, Yale College allows juniors and second-term sophomores to earn a full year or term of credit toward the bachelor's degree through the Year or Term Abroad program. Participation in the program provides students the opportunity to approach academic study through a different cultural perspective. Students apply to the Yale College Committee on the Year or Term Abroad for approval of a program of study abroad. The pertinent application procedures and regulations are listed under Special Arrangements in the Academic Regulations. Additional information is available from the Study Abroad office.

YALE IN LONDON

The Yale in London program offers spring-term courses in British art and culture at the Paul Mellon Centre for Studies in British Art, located in central London. The program is open to undergraduates, carries full Yale course credit, and counts as a term of enrollment. Instruction is designed to take advantage of the cultural resources of London and its environs, with regular field trips (including overnight stays) to museums, historic houses, and other sites of interest. Accommodations are provided for students in shared apartments. Further information is available on the program website, or from the Yale in London office at the Yale Center for British Art, or by email to yaleinlondon@yale.edu.

YALE IN LONDON SUMMER PROGRAM

Yale in London offers two overlapping summer sessions at the Paul Mellon Centre for Studies in British Art in central London, each lasting six weeks. There are two courses in each session, which vary from year to year and cover topics in humanities and social sciences, including history, history of art, architecture, sociology, literature, and drama. The courses are open to undergraduates and carry full Yale course credit, although enrollment in a Yale in London summer session does not count as a term of enrollment in Yale College. As with the spring program, the summer sessions take advantage of the cultural resources of London and its environs, and include overnight field trips. Accommodations are provided. Course descriptions and further information are available on the program website, or from the Yale in London office at the Yale Center for British Art, or by email to yaleinlondon@yale.edu.

THE MACMILLAN CENTER

The Whitney and Betty MacMillan Center for International and Area Studies at Yale is the University's focal point for promoting teaching and research on all aspects of international affairs, societies, and cultures around the world. It brings together

scholars from relevant schools and departments to provide comparative and problem-oriented teaching and research on regional, international, and global issues. The MacMillan Center oversees six undergraduate majors: African Studies, East Asian Studies, Latin American Studies, Modern Middle East Studies, Russian and East European Studies, and South Asian Studies. Language training is integral to each of the majors.

Further information about the MacMillan Center is available on the Yale MacMillan Center website.

JACKSON INSTITUTE FOR GLOBAL AFFAIRS

The Jackson Institute's mission is to inspire and prepare Yale students for global citizenship and service. The Institute administers the undergraduate major in Global Affairs and offers a number of courses that are open to students in Yale College, including GLBL 101, Gateway to Global Affairs. The Institute also administers several undergraduate fellowship competitions available to any Yale College student wishing to conduct independent research abroad, language study, or an internship related to international affairs.

Each year the Jackson Institute hosts Senior Fellows, leading practitioners and experts in global affairs who teach courses, give public lectures, and are available to consult with students on their career plans. The Jackson Institute's career services office serves as a resource for Yale College students contemplating careers in public service and other areas of global affairs. For further information, consult the Institute website.

Yale Summer Session

Yale Summer Session offers courses in the arts, engineering, humanities, mathematics, biological and physical sciences, and the social sciences. While most Summer Session courses are offered on campus in New Haven, an increasing number are offered online, and several others are offered as part of programs abroad. Courses in Summer Session are equivalent in credit and satisfy the same distributional requirements as their academic year counterparts, but are offered in a more concentrated and intensive form. Yale College students receive credit in Yale College for work successfully completed in Yale Summer Session. There are no auditing privileges in Yale Summer Session. Further information is available from the Yale Summer Session office or on the Summer Session website.

Advising and Academic Resources

ADVISING

What students ultimately take away from their four years at Yale largely depends on the careful planning they apply to their programs of study. It would be premature—and unrealistic—for beginning students to map out a fixed schedule of courses for the subsequent four years, yet it is advisable that they think ahead and make plans for the terms to come. There will be time and opportunity for students to revise such plans as their academic ideas develop.

Yale College does not prescribe a set program of study, in the belief that students who select their own courses are inevitably more engaged with them. As students shape

their educational goals, it is important that they seek informed advice. For incoming students who have not yet developed relationships with academic advisers on campus, Yale College furnishes a constellation of advising linked to the residential colleges. As students progress in their studies, usually by sophomore year, they select as their adviser a member of the faculty in an intended or potential major to guide their course selection.

In addition to these advisers, students often seek advice about academic matters, internship and research opportunities, student life, study abroad, and post-graduation options from other offices on campus, including the Center for International and Professional Experience, the Health Professions Advisory Program, the Office of Career Strategy, the University Libraries, the Yale College Dean's Office, and the cultural centers.

Residential Colleges

There are fourteen residential colleges: Berkeley, Branford, Davenport, Timothy Dwight, Jonathan Edwards, Benjamin Franklin, Grace Hopper, Morse, Pauli Murray, Pierson, Saybrook, Silliman, Ezra Stiles, and Trumbull. Leading each one is a resident head of college; and in each college a resident dean advises students on both academic and nonacademic matters. Associated with the head and the dean as fellows of the college are about fifty additional members of the University drawn from different departments and schools, many of whom serve as advisers to first-year students in the college. In addition, a group of seniors in each residential college, known as first-year counselors, serve as peer advisers to first-year students. Additional information about advising resources in the residential colleges can be found on each college website and the Advising Resources website.

Academic Departments

In each academic department and for every undergraduate major, a director of undergraduate studies (DUS) oversees the curriculum, placement matters, and advising resources for the major. In small majors, the DUS also typically serves as the primary adviser for all students in the major; in large majors, other members of the faculty often assist the DUS in providing advice for students. Much information about course placement and prerequisites, as well as requirements for each major, can be found in Chapter III. Additional information about advising resources and faculty in a department or program can be found on the relevant department website.

ACADEMIC RESOURCES

Yale Poorvu Center for Teaching and Learning

The Yale Poorvu Center for Teaching and Learning (The Poorvu Center) provides an array of teaching, tutoring, writing, and technology-enabled learning programs distributed across the University. The Center supports student learning and provides opportunities for students to develop as teachers, mentors, and leaders. Additionally, the Center houses the Academic Strategies program, which provides information, workshops, and individual mentoring to Yale College students on the skills central to active, empowered learning. More information is available on the Poorvu Center website.

WRITING TUTORS AND WRITING PARTNERS

The Yale Poorvu Center provides several ways for students to get help with writing. The most important of these is the presence of a writing tutor in each residential college. Tutors meet with students on a one-to-one basis to discuss rough drafts of work in progress, research techniques, revision strategies, or other matters relevant to effective writing. Tutors can help with any writing project: senior essays, course papers, graduate school and fellowship applications, or anything intended for publication. The Writing Partners, another resource, are undergraduate and graduate students who offer drop-in help to students at any stage of writing. Finally, the Poorvu Center website offers information on using sources effectively and avoiding plagiarism.

SCIENCE AND QUANTITATIVE REASONING TUTORS

Tutoring programs for science (SC) and quantitative reasoning (QR) courses are offered through the Poorvu Center. The Poorvu Center provides quantitative reasoning and science tutoring for every field in Yale College. Many courses provide their own Course-Based Peer Tutors (CBPTs) who can help students as they work on problem sets or study for exams, and who can review returned assignments. Information about CBPTs is available on the course syllabus and Canvas website. If a particular course does not have a CBPT, or if a student requires more help, the Residential College Math/Science tutors offer drop-in hours during which any science or quantitative reasoning topic can be addressed. Finally, students who need more individual attention can apply for small-group tutoring. More information on all of these programs can be found at the Poorvu Center website.

Center for Language Study

The Center for Language Study (CLS), provides resources for students of foreign languages and for language courses. The CLS also provides support for nonnative speakers of English through its English Language Program. For undergraduates enrolled in a foreign language course, the CLS offers peer tutoring in the target language. For students in Yale College and in the graduate and professional schools, the CLS offers specialized language programs such as Directed Independent Language Study (DILS) for the study of languages not taught at Yale, and the Fields program for discipline-specific language study at advanced levels. For professional school students, the CLS offers courses in language for special purposes, such as Spanish or Chinese for medical professionals. All language learners at Yale have access to CLS facilities, including its study rooms, distance facilities, and flexible learning spaces. For more information, including hours, a list of resources, and information about Yale's foreign language requirement and placement testing, see the Center website.

Resource Office on Disabilities

To ensure that all students have an equal opportunity to make the most of their Yale education, the Resource Office on Disabilities (ROD) facilitates individual accommodations for students with disabilities and works to remove physical and attitudinal barriers to their full participation in the University community. The ROD also provides information to any member of the Yale community. Services include, but are not limited to, classroom and academic accommodations, visual materials in alternative formats, and loans of special equipment. The required first step for a student with a disability is to contact the Resource Office on Disabilities to initiate the

process of obtaining disability-related accommodations. Registration with the ROD is confidential.

Generally, a student requiring academic accommodations needs to let the ROD know at the start of each term. Students should complete this step as soon as their schedule is known. At any time during a term, students with a newly diagnosed disability or recently sustained injury requiring accommodations should contact the ROD. More information can be found on the ROD website, including instructions for requesting or renewing accommodations. You can also reach us by phone at 432-2324.

Special Programs

DIRECTED STUDIES

Directed Studies (DS), a selective program for first-year students, is an interdisciplinary introduction to influential texts that have shaped Western civilization, spanning from ancient Greece to the twentieth century. Consisting of three integrated full-year courses in literature, philosophy, and historical and political thought, Directed Studies provides a coherent program of study that encourages students to put rich and complex texts into conversation with one another across time and disciplinary boundaries. From day one to the end of their first year, students in Directed Studies engage in critical thinking through learning to analyze challenging and urgent texts, participate meaningfully in seminar discussions, and write clear and persuasive analytic essays. Directed Studies has no prerequisites and provides a strong foundation for any major. Approximately ten-percent of the first-year class is admitted each year to the program, which also satisfies Yale College distribution requirements in Humanities and Arts (HU), Social Sciences (SO), and Writing (WR). Students entering the program must enroll in all three courses and are expected to enroll for both semesters. Students participating in DS become members of a close-knit and supportive intellectual cohort that endures well beyond the end of the first year. Additional information is available on the program website.

THE DEVANE LECTURES

The DeVane Lectures are a special series of lectures that are open to the general public as well as to students and to other members of the Yale community. They were established in 1969 in honor of William Clyde DeVane, Dean of Yale College from 1939 to 1963. Details of the course are listed under DeVane Lecture Course in Subjects of Instruction. Supplementary meetings will be held for those students taking the lectures for credit.

FIRST-YEAR SEMINAR PROGRAM

The First-Year Seminar program offers a diverse array of courses open only to first-year students and designed with first-year students in mind. Enrollment in seminars is limited to fifteen or eighteen students, depending on the nature of the course. Most seminars meet twice each week and do not, unless otherwise noted, presume any prior experience in the field. Roughly eighty first-year seminars across a wide range of subjects are offered every year, in both fall and spring terms. Students must apply for these seminars before the beginning of each term. A description of the program and application procedures can be viewed on the program website.

FRANCIS WRITER-IN-RESIDENCE

The Francis Writer-in-Residence in Yale College is a distinguished writer of nonfiction who teaches either one or two courses each academic year. He or she is actively engaged with undergraduate life and serves as an academic mentor through seminars, readings, meetings with students, and other activities. The Francis Writer-in-Residence for 2019–2020 is Anne Fadiman.

RESERVE OFFICERS TRAINING CORPS (ROTC)

Yale hosts both Naval and Air Force ROTC units, which offer qualified Yale College students an opportunity to pursue their regular Yale degrees while also preparing for leadership positions in the United States Air Force, Navy, or Marine Corps. Regardless of financial need, participating students may receive significant help in meeting the costs of a Yale education. Further information about the Air Force ROTC program can be found on the Yale AFROTC website or under Aerospace Studies in Subjects of Instruction. Further information about the Naval ROTC program (including the Marine Corps program) can be found on the Yale NROTC website or under Naval Science in Subjects of Instruction. Students not matriculated at Yale who are participating in the Air Force ROTC program as part of a cross-town arrangement are subject to Yale College's *Undergraduate Regulations*.

RESIDENTIAL COLLEGE SEMINARS

The Residential College Seminar program, instituted in 1968, is devoted to the development of innovative courses that fall outside traditional departmental structures. The instructors for the seminar program are drawn from the University community and from the region, including individuals outside academic life such as writers, artists, participants in government and the public sector, and experts from the arts and the media. The college seminar program encourages innovative courses, and student committees in the residential colleges play a significant role in selecting seminars, but all courses in the program must satisfy standard requirements for academic credit in Yale College and must be approved by the relevant faculty committees that oversee the curriculum. Each residential college sponsors at least one seminar each term. Additional seminars are occasionally sponsored directly by the program and are equally open to students from all residential colleges. Descriptions of the seminars are found on the program website.

ROSENKRANZ WRITER-IN-RESIDENCE

The Rosenkranz Writer-in-Residence in Yale College is a distinguished professional writer, chosen from fiction writers, playwrights, critics, journalists, screenwriters, essayists, poets, and social commentators. Both as a fellow of a residential college and as an instructor of one or two courses in each academic year, the Rosenkranz Writer-in-Residence meets formally and informally with students through classes and through readings and extracurricular activities. The Rosenkranz Writer-in-Residence for 2019–2020 is Louise Glück.

STUDIES IN GRAND STRATEGY

Studies in Grand Strategy is a two-semester, calendar-year interdisciplinary seminar. The class investigates methods and materials for teaching and understanding grand strategy as a historical concept and as an active approach to geopolitics, statecraft, and

social change. Each course, worth one credit, emphasizes connections between history and strategy, scholarship and real-world practice, leadership and citizenship. The two-term seminar aims to educate students intending to pursue careers in a wide variety of fields and is part of the Brady-Johnson Program in Grand Strategy. Additional information can be found on the program website.

YALE JOURNALISM INITIATIVE

The Yale Journalism Initiative brings a distinguished writer to campus each semester to teach an advanced journalism seminar, ENGL 467. The seminar is open to undergraduates and select graduate and professional students; application is required through the English department's selection process for creative writing classes. Students who complete the seminar may apply to become a Yale Journalism Scholar, a distinction that provides access to summer support for internships, career counseling with a journalism specialist, and invitations to meet professional journalists at events both on and off campus. For more information on the initiative or on becoming a Journalism Scholar, see the Journalism Initiative website.

Honors

GENERAL HONORS

The bachelor's degree *cum laude*, *magna cum laude*, or *summa cum laude* is awarded at graduation on the basis of a student's general performance in courses taken at Yale. At Commencement, General Honors are awarded to no more than 30 percent of the class. The bachelor's degree is awarded *summa cum laude* to no more than the top 5 percent of the graduating class, *magna cum laude* to no more than the next 10 percent of the graduating class, *cum laude* to no more than the next 15 percent of the graduating class. Eligibility for General Honors is based on the grade point average (GPA) earned in courses taken only at Yale, with letter grades carrying the following values:

A	4.00	B-	2.67	D+	1.33
A-	3.67	C+	2.33	D	1.00
B+	3.33	C	2.00	D-	0.67
B	3.00	C-	1.67	F	0.00

Marks of CR in courses taken on a Credit/D/Fail basis are not included in the calculation of grade point averages. Marks of W, for Withdrawal, carry no course credit, and do not figure in a grade point average.

DISTINCTION IN THE MAJOR

Distinction in the Major is conferred at graduation on any senior who, on nomination by the student's department or program, and with the concurrence of the Committee on Honors and Academic Standing, merits such an award for the quality of work completed in the major subject.

Distinction is awarded to students who have earned grades of A or A- in three-quarters of the credits in the major subject or program and who have earned a grade of A or A- on the senior departmental examination, senior essay, or senior project. All courses taken for the major are included in these calculations for Distinction in the Major. Grades of F and marks of CR in courses taken Credit/D/Fail are included as non-A

grades. Marks of W, for Withdrawal, which carry no course credit, and marks of P, for Pass, do not figure in the calculation for Distinction.

PHI BETA KAPPA

Election to Phi Beta Kappa is based on the percentage of grades of A earned at Yale. The grade point average (GPA) is not a factor. Marks of CR in courses taken Credit/D/Fail are counted as non-A grades. Marks of P in courses that are graded only on a Pass/Fail basis, such as independent study courses, are not included in the calculations. Marks of W, for Withdrawal, carry no course credit, and do not figure in the calculation for Phi Beta Kappa. Grades earned outside Yale, including those earned during study abroad other than at Yale in London, are also not included in the calculation. Further information about the criteria for election and about the Yale chapter can be found on the Yale Phi Beta Kappa website.

PRIZES

For a list of the numerous prizes open annually to students in Yale College, consult the Yale Prizes website.

II. ACADEMIC REGULATIONS

Academic Regulations

As a condition of enrollment in Yale College, every student is required to comply with the academic regulations. Students are expected to familiarize themselves with these regulations, and an assertion of ignorance of their provisions cannot be accepted as a basis for an exception to them. No student or group of students should expect to be warned individually to conform to any of the regulations contained in this publication. Students are advised to pay special attention to all deadlines given in the academic regulations. Students who have questions or concerns about these regulations should consult with their residential college dean.

A. Requirements for the B.A. or B.S. Degree

To qualify for the bachelor's degree, B.A. or B.S., a student must successfully complete thirty-six term courses in Yale College or their equivalent. In doing so, the student must fulfill the distributional requirements of Yale College and the requirements of a major program. A student may normally complete no more than eight terms of enrollment in order to fulfill these requirements.

During the terms that students are enrolled and in residence in Yale College, they cannot be simultaneously enrolled, either full-time or part-time, in any other school or college at any other institution, with the exception of other Yale University schools that permit currently enrolled undergraduates to be admitted to programs that have been established within Yale College. Examples of such programs include the simultaneous award of the bachelor's and master's degree and the five-year B.A.-B.S./M.P.H. degree program in Public Health. Exceptions will also be made for Yale College students whose participation in the Reserve Officers Training Corps program requires enrollment in courses offered outside of Yale.

Students enrolled in the Eli Whitney Students program should consult section M, Eli Whitney Students Program.

Students who have already earned a bachelor's degree, at Yale or at another institution, are not eligible for degree enrollment in Yale College.

DISTRIBUTIONAL REQUIREMENTS

All students in Yale College must fulfill distributional requirements in order to qualify for the bachelor's degree. For a general introduction to the distributional requirements and a definition of the disciplinary areas and skills categories, refer to The Undergraduate Curriculum.

1. **Distributional requirements for the first, sophomore, and junior years** Students must partially fulfill the distributional requirements during the first, sophomore, and junior years in order to be eligible for promotion.

Distributional requirements for the first year Students must have enrolled for at least one course credit in two skills categories by the end of the second term of enrollment in order to be eligible for promotion to sophomore standing. They may elect no more than four course credits in a single department, and no more than six

course credits in a single disciplinary area, except that a student taking a laboratory course may elect as many as seven course credits in the sciences.

Note that credit from outside Yale may not be applied toward the distributional requirements for the first year; accordingly, students who are permitted by the Committee on Honors and Academic Standing to repair a deficiency in these requirements over the summer following their first year must do so by means of enrollment in Yale Summer Session.

Distributional requirements for the sophomore year Students must have enrolled for at least one course credit in each of the three disciplinary areas and for at least one course credit in each of the three skills categories by the end of the fourth term of enrollment in order to be eligible for promotion to junior standing.

Distributional requirements for the junior year Students must have completed all of their skills requirements, and must have earned at least one course credit in each of the three disciplinary areas, by the end of the sixth term of enrollment in order to be eligible for promotion to senior standing.

2. **Multiple distributional designations** Although some courses may carry more than one distributional designation, a single course may be applied to only one distributional requirement. For example, if a course is designated both HU and SO it may be applied toward either the humanities and arts requirement or the social science requirement, but not both. Similarly, if a course is designated QR and SC, it may be applied toward either the quantitative reasoning requirement or the science requirement, but not both.

A course with multiple distributional designations, once applied toward one distributional requirement, may subsequently be applied toward a different distributional requirement. During the summer after each academic year, the University Registrar's Office optimizes the use of each student's completed courses toward fulfillment of the distributional requirements.

3. **Foreign language distributional requirement** All students are required to engage in the study of a foreign language while enrolled in Yale College. The most common paths to fulfillment of the foreign language distributional requirement are illustrated in the chart at the end of this section.

Students who matriculate at Yale with no previous foreign language training must complete three terms of instruction in a single foreign language. This requirement is fulfilled by the completion of courses designated L1, L2, and L3.

Students who have taken the Advanced Placement examination in French, German, Italian, Latin, or Spanish, and who present scores of 5, are recognized as having completed the intermediate level of study. Scores of 6 or 7 on the International Baccalaureate Advanced-Level examination are also accepted as evidence of intermediate-level accomplishment. Students at this level fulfill the language distributional requirement by completing one course designated L5. Alternatively, they may successfully complete one or more courses in a different foreign language at least through the level designated L2.

Students who have studied a foreign language before matriculating at Yale but who have not achieved a score of 5 on the Advanced Placement test in French, German, Italian, Latin, or Spanish must take a placement test offered by the appropriate

language department or, for languages in which no departmental placement test is offered, consult the appropriate director of undergraduate studies. Dates and times of placement tests are given in the *Calendar for the Opening Days of College* and on the Center for Language Study website. The departmental test determines whether students place into the first, second, third, or fourth term of language study (courses designated L1, L2, L3, or L4), or whether they qualify for language courses beyond the fourth term of study (L5).

Students who place into the first term of a foreign language must successfully complete three courses in that language, designated L1, L2, and L3.

Students who matriculate at Yale able to place into the second term of a foreign language must successfully complete three courses in that language, designated L2, L3, and L4. Alternatively, they may successfully complete three courses in a different foreign language at least through the level designated L3.

Students who matriculate at Yale able to place into the third term of a foreign language must successfully complete two courses in that language, designated L3 and L4. Alternatively, they may successfully complete two or more courses in a different foreign language at least through the level designated L3.

Students who matriculate at Yale able to place into the fourth term of a foreign language must successfully complete one course in that language, designated L4. Alternatively, they may successfully complete one or more courses in a different foreign language at least through the level designated L3.

Students who matriculate at Yale able to place into the fifth term of a foreign language must successfully complete one course in that language, designated L5. Alternatively, they may successfully complete one or more courses in a different foreign language at least through the level designated L2.

Students whose secondary school transcript shows that the language of instruction was other than English may fulfill the foreign language requirement by successfully completing ENGL 114, 115, 120, 121, or 450. Alternatively, students in this category may fulfill the requirement by successfully completing one or more courses in a third language, neither English nor the language of their secondary school instruction, at least through the level designated L2.

In order to promote firsthand experience in foreign cultures and the learning of language in real-world settings, students are permitted to apply toward the satisfaction of the foreign language requirement the completion of an approved study abroad program in a foreign-language-speaking setting if they have first completed or placed out of a language course designated L2. Students seeking to undertake study at another institution or program for this purpose must consult the relevant director of undergraduate studies in advance of their proposed study for advice about appropriate programs and courses, and for information about the approval process. See section P, Credit from Other Universities. Study abroad may be used in place of L1 and L2 courses only if it is part of a Yale College program, such as Yale Summer Session. Study abroad opportunities are described in The Undergraduate Curriculum under International Experience.

Intensive language courses provide the equivalent of a full year of instruction in a single term. A course designated L1–L2 fulfills both the L1 and the L2 levels of the

foreign language distributional requirement. Similarly, a course designated L3–L4 satisfies both the L3 and the L4 levels.

Not all of the languages offered in Yale College are offered at all levels, and it may not be possible to fulfill the language requirement in some of them. Languages currently offered in Yale College are Akkadian, American Sign Language, Arabic, Bengali, Bosnian-Croatian-Serbian, Chinese, Czech, Dutch, hieroglyphic Egyptian, French, German, ancient Greek, modern Greek, biblical Hebrew, modern Hebrew, Hindi, Hungarian, Indonesian, isiZulu, Italian, Japanese, Khmer, Kiswahili, Korean, Latin, Persian, Polish, Portuguese, Punjabi, Romanian, Russian, Sanskrit, Sinhala, Spanish, Tamil, classical Tibetan, modern Tibetan, Turkish, Ukrainian, Vietnamese, Wolof, and Yorùbá. Students wishing to fulfill the foreign language requirement in a less commonly taught language should consult the director of undergraduate studies in the relevant department to verify that the appropriate level of study will be offered. Students who have intermediate- or higher-level proficiency in a language other than those listed here should consult the appropriate director of undergraduate studies or the director of the Center for Language Study to arrange for a placement examination.

Students who, for medical reasons, are not able to complete the language requirement may petition the Committee on Honors and Academic Standing for a partial waiver of the requirement. In granting such a waiver, the committee will normally require that a student complete four course credits in the study of a specific non-English-speaking culture.

4. **Courses taken on the Credit/D/Fail basis** A student may not apply any course credit earned on the Credit/D/Fail basis toward satisfaction of the distributional requirements for the junior year nor for the distributional requirements for the bachelor's degree.
5. **Independent study courses** A student may not apply any course credit earned through independent study courses toward satisfaction of any of the distributional requirements.
6. **Acceleration credits** Acceleration credits may not be employed to satisfy the distributional requirements for the bachelor's degree, nor may they be employed to meet the distributional requirements for the first, sophomore, or junior years.
7. **Course credit earned at Yale before matriculation** Course credit earned at Yale before a student's matriculation, either at Yale Summer Session or in the Non-degree Students program while the student was enrolled as a secondary school student in the New Haven area, may be applied to the distributional requirements for the bachelor's degree and to those for the sophomore and junior years, but it may not be applied to the distributional requirements for the first year.
8. **Courses in the graduate and professional schools** It is the expectation that Yale College students, including candidates for the simultaneous award of the bachelor's and master's degrees, will fulfill their distributional requirements in courses taken in Yale College. Credit earned in a course offered in the Graduate School of Arts and Sciences or in one of the professional schools of the University may be applied toward the distributional requirements only if the course instructor has secured, in advance of the term in which the course will be given, approval from Yale College.

Instructors interested in making such an advance arrangement can contact the Dean of Academic Affairs to be directed to the appropriate authority for such approval.

9. **Course credit from outside Yale** Course credit earned at another university may be applied toward the distributional requirements for the bachelor's degree and to those for the sophomore and junior years whether or not it is counted toward the 36-course-credit requirement for graduation. Credit from outside Yale may not be applied toward the distributional requirements for the first year. See section P, Credit from Other Universities. Note particularly that Yale does not award course credit or distributional credit for courses completed at another college or university before the student graduated from secondary school.
10. **Major programs** Courses taken in fulfillment of a student's major requirements may be applied toward satisfaction of the distributional requirements for the first, sophomore, and junior years and toward the distributional requirements for the bachelor's degree.
11. **Permission for a partial waiver of the distributional requirements for the first year** If, with the permission of the residential college dean, a first-year student enrolls in a program of study for the first two terms of enrollment worth more than nine course credits, the dean may waive the year limit on the number of course credits that a student may elect in a single department or disciplinary area. Under no circumstances may a student be promoted to sophomore standing without having enrolled for at least one course credit in two skills categories (foreign language, quantitative reasoning, writing).
12. **Permission to postpone fulfillment of the distributional requirements for the sophomore year** A student may petition the Committee on Honors and Academic Standing for permission to fulfill the distributional requirements for the sophomore year in the fifth term of enrollment. Such a petition must be filed no later than the date of midterm of the fourth term of enrollment; it should explain the sound academic reasons why these requirements cannot be satisfied within four terms of enrollment and give an exact description of how they will be fulfilled in the fifth term. Students who have not fulfilled the distributional requirements for the sophomore year by the end of the fourth term of enrollment and who have not been granted permission by the Committee on Honors and Academic Standing to postpone their fulfillment will normally not be promoted to junior standing.
13. **Permission to postpone fulfillment of the distributional requirements for the junior year** In exceptional circumstances, a student may petition the Committee on Honors and Academic Standing for permission to fulfill the distributional requirements for the junior year in the seventh term of enrollment. Such a petition, which must include the written support of the residential college dean and, where applicable, that of the director of undergraduate studies in the student's major, should be filed no later than the date on which the student's course schedule is due in the sixth term of enrollment; in no case will a petition be accepted later than the date of midterm in the sixth term of enrollment. It should explain the sound academic reasons why these requirements cannot be satisfied within six terms of enrollment and give an exact description of how they will be fulfilled in the seventh term. Students who have not fulfilled the distributional requirements for the junior year by the end of the sixth term of enrollment and who have not been granted

permission by the Committee on Honors and Academic Standing to postpone their fulfillment will normally not be promoted to senior standing.

MAJOR REQUIREMENTS

The requirements of the various major programs are given under the heading for each department or program. Every major program includes a senior requirement, which may take the form of a senior essay, a senior project, or a senior departmental examination.

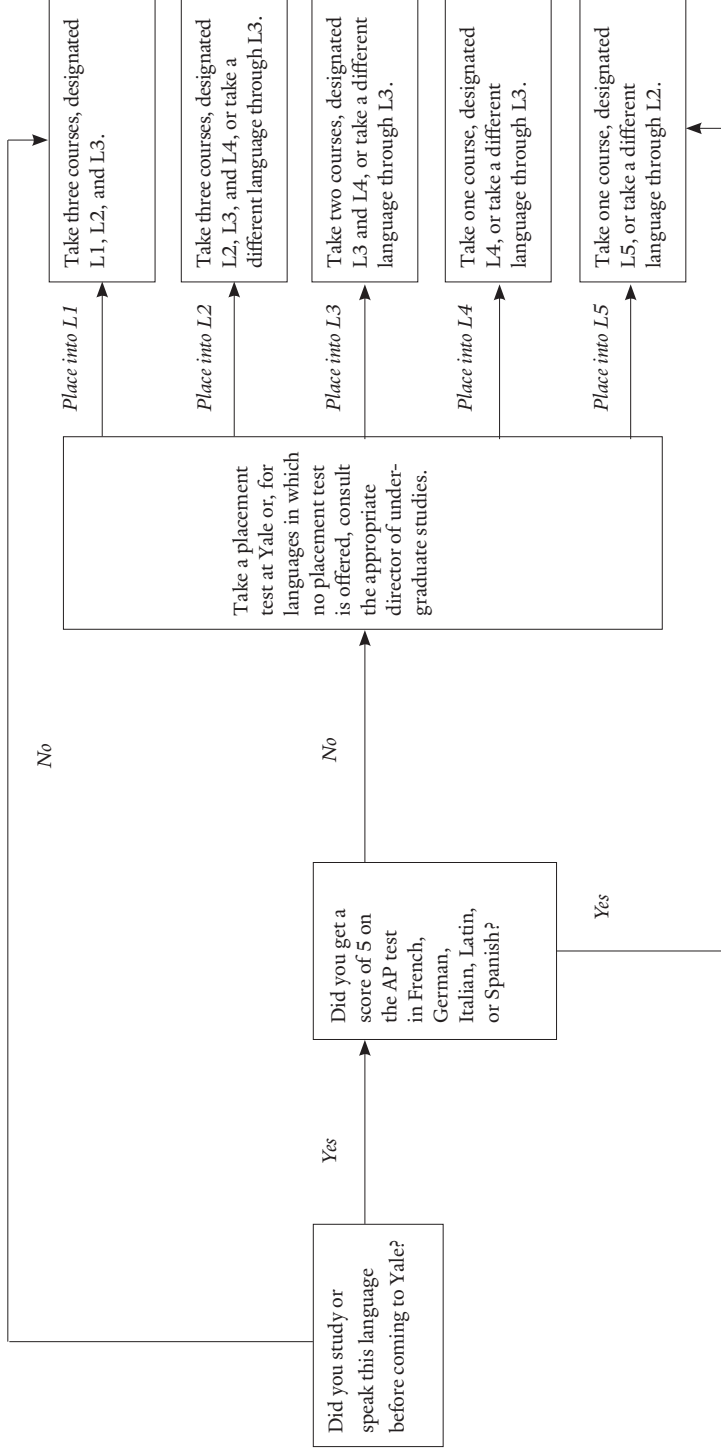
EIGHT TERMS OF ENROLLMENT

A student must complete the requirements for the bachelor's degree in no more than eight terms of enrollment. Terms spent on a Year or Term Abroad, or in the Yale College program at the Paul Mellon Centre in London during a spring term, are considered the equivalent of terms of enrollment in Yale College. Note, however, that course credits earned in terms spent on a Year or Term Abroad may not be applied to acceleration by the early accumulation of thirty-six course credits all earned at Yale. See section Q, Acceleration Policies. (Attendance at the summer program at the Paul Mellon Centre in London or Yale Summer Session does not constitute a term of enrollment in Yale College.)

In exceptional circumstances, a student may petition the Yale College Committee on Honors and Academic Standing for permission to enroll for an additional term. Such a petition should be made no later than the beginning of a student's seventh term of enrollment; it should describe precisely, giving detailed information on specific courses, why it is impossible for the student to complete the requirements for a bachelor's degree within eight terms; and it should be accompanied by detailed, informative letters of endorsement from the student's director of undergraduate studies and residential college dean. When the request is being made in whole or in part on medical grounds, documentation must be provided by a treating physician or therapist, or the Resource Office on Disabilities, or both. The Committee on Honors and Academic Standing cannot grant permission for a ninth term in order for a student to undertake an optional arrangement not necessary for the acquisition of a bachelor's degree, such as, for example, the completion of two majors, or enrollment in the Program for the Simultaneous Award of the Bachelor's and Master's Degrees, or completion of the entrance requirements for graduate or professional school. A student given permission to enroll for a ninth term is not eligible for scholarship assistance from Yale, although other forms of financial aid may be available. See "Financial Aid" under "Regulations" in the Yale College online publication *Undergraduate Regulations*.

Graduation in fewer than eight terms of enrollment is possible: see section Q, Acceleration Policies. Under no circumstances may a student graduate in fewer than six terms of enrollment, unless the student was admitted by transfer from another college or university. Transfer students should consult section L, Transfer Students.

MOST COMMON PATHS TOWARD FULFILLMENT OF THE LANGUAGE REQUIREMENT



B. Grades

LETTER GRADES

The letter grades in Yale College are:

A	Excellent	B+		C+		D+		F	Fail
A-		B	Good	C	Satisfactory	D	Passing		
		B-		C-		D-			

CREDIT/D/FAIL OPTION

The opportunity to elect courses on a Credit/D/Fail basis has been provided by the Yale College Faculty in order to encourage academic exploration and to promote diversity in students' programs.

1. **Reporting of grades** In all courses (except for a few professional school courses), instructors report letter grades for all students. If the student has chosen the Credit/D/Fail option in a course, the registrar converts grades of A, A-, B+, B, B-, C+, C, and C- into the notation CR, which is entered on the student's transcript. Grades of D+, D, D-, and F are entered on the transcript as reported. A student may not be required to disclose to the instructor of a course whether the student has enrolled in the course for a letter grade or under the Credit/D/Fail option.
2. **Eligibility** All courses, other than independent study courses, that are offered in Yale College during the fall and spring terms are available for election under the Credit/D/Fail option. (See "Independent Study Courses," below, for information on the grading of such courses.)
3. **Total number of course credits** A student may offer as many as four course credits earned on the Credit/D/Fail basis toward the bachelor's degree.
4. **Number of courses and course credits in a term** As many as two credits may be elected under the Credit/D/Fail option in a term; thus in an academic year a student may earn as many as four credits on the Credit/D/Fail option. In each term, a student must elect at least two courses, representing at least two course credits, for letter grades or the mark of Pass, in any combination.

For students enrolled in the Eli Whitney Students program, who are permitted to enroll in as few as three course credits in a calendar year and thus sometimes enroll in only one course credit in a term, different limits apply. An Eli Whitney student who is enrolled in fewer than two course credits in a term may elect no course credits that term under the Credit/D/Fail option. An Eli Whitney student who is enrolled in two or more but fewer than four course credits in a term may elect no more than one course credit that term under the Credit/D/Fail option. An Eli Whitney student who is enrolled in four or more course credits in a term is bound by the limits given in the paragraph immediately above.
5. **Distributional requirements** A student may not apply any course credit earned on the Credit/D/Fail basis toward satisfaction of the distributional requirements for the junior year, or toward satisfaction of the distributional requirements for the bachelor's degree.

6. **Requirements of the major** The program description of each major specifies whether or not courses taken on the Credit/D/Fail basis count toward the requirements of that major.
7. **Credit/year course sequences** A credit/year course sequence may be taken under the Credit/D/Fail option for one term while the other term of the yearlong sequence is taken for a letter grade. For credit/year course sequences in which a student receives a separate letter grade for each of the two terms, each term will be governed by the enrollment option the student elected for that term. For credit/year course sequences in which a student receives the mark of SAT or NSAT for the first term and a letter grade for the second, the enrollment option that the student elects for the second term governs both terms of the course sequence; that is, students will receive either the mark of CR for both terms or a letter grade for both terms, depending on the option elected for the second term.
8. **Course schedules** At the start of each term, students enroll in all courses without selecting any for the Credit/D/Fail option. They may subsequently select that option in any Yale College course – other than those independent study courses graded on a Pass/Fail basis – by midterm, as published in the Yale College Calendar with Pertinent Deadlines. After the midterm deadline, election of the Credit/D/Fail option is not permitted. As indicated above, in a given term a student may elect as many as (but no more than) two course credits on the Credit/D/Fail basis; and must elect at least two courses, representing at least two course credits, for letter grades or the mark of Pass, in any combination.
9. **Conversion back to a letter grade** Once a student converts a course to the Credit/D/Fail mode, this change cannot be reversed, even if that action is sought before the midterm deadline.
10. **Acceleration credit** Work completed under the Credit/D/Fail option cannot yield acceleration credit.
11. **Prizes and honors** Marks of CR are included in the calculations for some prizes, for Distinction in the Major, and for election to Phi Beta Kappa as non-A grades, but marks of CR are not included in the calculation for General Honors. See Honors in The Undergraduate Curriculum.
12. **Courses in the graduate and professional schools** Courses in the Graduate School of Arts and Sciences and in the professional schools of the University are not available on the Yale College Credit/D/Fail option. Some courses in certain professional schools of the University are, however, graded on a Pass/Fail basis only, and grades for undergraduates in these courses are recorded as CR or F. Such credits are counted in the total earned on the Credit/D/Fail basis that a student is permitted to offer in a term as well as the total offered toward the requirements of a bachelor's degree. Marks of CR in professional school courses are included in the calculations for Distinction in the Major as non-A grades. Marks of CR in professional school courses are not included in the calculation for General Honors. See "General Honors" and "Distinction in the Major" under Honors in The Undergraduate Curriculum.

INDEPENDENT STUDY COURSES

Independent study courses, other than senior essays or projects and other exempted courses as explained below, are graded on a Pass ("P")/Fail ("F") basis, with the

additional requirement that the instructor of record submit a substantive report that both describes the nature of the independent study and evaluates the student's performance in it. These reports will be shared with the student and the director of undergraduate studies in the department or program in which the course is offered, and kept in the office of the student's residential college dean.

Senior projects and courses deemed by a department or program to be a constituent of the senior requirement are evaluated with a letter grade. Additionally, the department or program offering a particular independent study course may deem that such a course should be exempted from Pass/Fail grading for a particular student because the course meets an important requirement in the major. In such a case, the director of undergraduate studies in the department or program that will be applying the course toward its major requirements may petition the Committee on Honors and Academic Standing to permit the student's work in the course to be evaluated with a letter grade. Such a petition should be filed by the date on which the student's schedule is due in the term in which the student is enrolling in the course, and should provide sound academic reasons for the exception. In no case will such a petition be accepted later than the date of midterm in the term in which the course is being taken.

GENERAL REGULATIONS CONCERNING GRADES AND TRANSCRIPTS

1. **Record of courses** A transcript is the record of courses in which a student has enrolled during the student's progress in completing the requirements of the bachelor's degree. All grades, passing and failing, thus appear on the transcript and are counted in the calculation of grade point average (GPA). These include passing grades earned in the first term of a credit/year course sequence in which the second term is not completed, even though such grades do not count toward the 36-course-credit requirement for graduation. If a student remains in a course after the date of midterm, the student is considered to have been enrolled in that course; therefore, if a student withdraws from the course after midterm and before the first day of the reading period, the mark W (for Withdrew) appears on the transcript in association with the course. See paragraph 4 below.
2. **Equal value of courses** Passing grades contribute equally, to the extent to which they carry course credit, toward the 36-course-credit requirement for graduation. A grade of D in a course, for example, does not need to be balanced with a higher grade in some other course.
3. **Change of a grade** A grade, once submitted by the instructor of a course to the registrar, may not be changed except by vote of the Yale College Committee on Honors and Academic Standing on petition of the instructor, unless it is the result of a clerical error made in the instructor's computation or in transcription of a grade.
4. **Deadlines for withdrawal from courses** If a student has elected a full-term course on the course schedule but formally withdraws from it before midterm, as published in the Yale College Calendar with Pertinent Deadlines, the student's transcript will contain no indication of that course after the withdrawal has been recorded by the registrar. If a student has elected a half-term course on the course schedule but formally withdraws from it by the relevant deadline published in the Yale College Calendar with Pertinent Deadlines, the student's transcript will contain

no indication of that course after the withdrawal has been recorded by the registrar. See section F, Withdrawal from Courses.

If a student enrolled in a full-term course formally withdraws from it after midterm but before the first day of the reading period, the student's transcript will record the designation W (Withdraw) for the course. In credit/year course sequences in which a student receives the mark of SAT or NSAT for the first term and a letter grade for the second, a student who completes the first term but does not subsequently enroll in the second term, or who subsequently withdraws from the second term before the second term is completed, will have the designation W (Withdraw) recorded for the first term of the sequence.

If a student enrolled in a half-term course formally withdraws from it after the deadline for the course to be removed from the transcript, but by the last date a withdrawal is permitted from the course, the student's transcript will record the neutral designation W (Withdraw) for the course. See the Yale College Calendar with Pertinent Deadlines for both dates in each term.

The mark of W is a neutral designation indicating simply that the student has been enrolled in, but has withdrawn from, a course; while the course obviously carries no credit toward the degree, the W implies no evaluation of a student's work and carries no implication whatsoever of failure. Withdrawal from a course after the last day of classes, as published in the Yale College Calendar with Pertinent Deadlines, is not possible. See section F, Withdrawal from Courses.

5. **Incomplete work and postponed final examinations** A student who has received permission for a mark of Temporary Incomplete in a course, or who has been authorized to take a makeup final examination in a course, is allowed the specified period of time to repair the deficiency in the course. If the deficiency is not repaired by a satisfactory performance within the stipulated time, then the designation TI (Authorized Temporary Incomplete) or ABX (Authorized Absence from Final Examination) is automatically converted by the registrar to the grade of F. See "Postponement of Final Examinations" and "Work Incomplete at the End of Term" in section H, Completion of Course Work.
6. **Withdrawal from Yale College** Whether a student withdraws from Yale College for personal, medical, academic, or financial reasons, the entry placed in each case on the student's transcript is the word "Withdraw" together with the date of the withdrawal. When a student is withdrawn for disciplinary reasons, the entry placed on the student's transcript is the word "Suspended" together with the date of the suspension.
7. **Tracks and programs within majors** A transcript may show as a student's major subject only a designation approved for that purpose by the Yale College Faculty; "tracks" or programs within majors may not appear on transcripts. The majors approved by the faculty are listed under Majors in Yale College.
8. **Access to grades** Access to recorded grades is available online to students in any Yale College course for which they have completed or actively declined to complete the online course evaluation form through the Yale Student Information System (SIS). Students have the opportunity to grant online access to their grades to certain other parties through the Proxy Management menu in the Student

Information System. The Registrar's Office will provide paper grade reports only upon the specific written request of the student.

9. **Transcript orders** Transcript ordering instructions can be found on the University Registrar's Office website. The charge is \$8 per transcript.

C. Course Credits and Course Loads

CREDIT VALUE OF COURSES

Most courses in Yale College are term courses that carry one course credit if completed with a passing grade. There are, however, some variations:

1. **Double-credit courses** Certain courses in Yale College, including intensive language or research courses, award two course credits for a single term's work.
2. **Yearlong course sequences** There are some yearlong course sequences in which two course credits are awarded upon the satisfactory completion of both terms of the sequence; other course sequences, including some research and laboratory courses, give one or four course credits for the successful completion of the full year's work. A student who fails the first term of a year-long course sequence may continue the sequence only with the instructor's written permission, and will receive course credit only for the successful completion of the second term's work. A student who satisfactorily completes the first term of a year-long course sequence may receive course credit routinely for that term's work, except where noted otherwise in the course listing.

The completion of the first term only of an introductory modern foreign language earns credit whether or not a subsequent term of that language is completed. Neither instructors nor departments have the authority to make an exception to this rule.

3. **Laboratory courses** Some laboratory courses carry no separate credit toward the degree; others carry a full course credit for a term's work; and still others carry one-half course credit.
4. **Half-credit courses** All courses that carry 0.5 or 1.5 course credits and that are not bound by the credit/year restriction count toward the 36-course-credit requirement for the bachelor's degree.

NORMAL PROGRAM OF STUDY

A student in Yale College normally takes four or five term courses, or their equivalent, for each of eight terms.

1. **Minimum course load** A student may not enroll in a program of study worth fewer than three course credits in one term. A student enrolled for three course credits may withdraw from one course credit between midterm and the first day of the reading period, receiving the neutral designation W (Withdrawn) in that course. Similarly, a student enrolled for four or more course credits may withdraw from one or more courses as described above, but at no time may any student carry a schedule of courses that will earn fewer than two course credits in a term.
2. **Course loads requiring permission** A three-course-credit program of study or a six-course-credit program of study requires the permission of the residential college dean. It is assumed that any student who requests permission to carry more than

five course credits does not intend to drop any of them. Permission for a program of six course credits will normally not be given to a student who is not in academic good standing.

3. **Seven course credits in a term** A student must petition the Yale College Committee on Honors and Academic Standing for permission to take a program worth seven credits in a term. In the petition the student must explicitly state an intention to complete all the courses proposed.
4. **Independent study** Opportunities for independent study exist in many programs and departments under various designations: directed reading or research; individual reading or research; independent research or study; independent or special projects; individual instruction in music performance; independent, individual, or special tutorials; and the senior essay or project, among others. Note that course credit earned in such study may not be used toward fulfillment of the distributional requirements, and students may not enroll in independent study courses in the graduate or professional schools. Approval for any such particular course is given by the department or program; however, approval for an independent study course is also required from the Yale College Committee on Honors and Academic Standing if certain limits are exceeded. A student must petition the Committee for permission to enroll in more than one such course credit in any one term before the senior year, or in more than two such course credits in any one term during the senior year. Permission is also required for a student to enroll in more than three such course credits in the first six terms of enrollment; included in this total are any independent study courses completed in Yale Summer Session that are applied to the Yale College transcript. In the petition the student must give sound academic reasons for exceeding these limits, and provide evidence that the additional work in independent study will not be done at the expense of the breadth and depth of study being pursued in regular Yale College courses. Students admitted to the Program for the Simultaneous Award of the Bachelor's and Master's Degrees are not required to seek permission of the Committee on Honors and Academic Standing to enroll in independent study courses when that enrollment exceeds the limits above and such work is required for the completion of that program.

D. Promotion and Good Standing

REQUIREMENTS FOR PROMOTION

1. To be promoted to sophomore standing after two terms of enrollment, a student must have earned at least eight course credits or the equivalent and have fulfilled the distributional requirements for the first year.
2. To be promoted to junior standing after four terms of enrollment, a student must have earned at least sixteen course credits or the equivalent and is expected to have fulfilled the distributional requirements for the sophomore year.
3. To be promoted to senior standing after six terms of enrollment, a student must have earned at least twenty-six course credits or the equivalent and is expected to have fulfilled the distributional requirements for the junior year.

REQUIREMENTS FOR ACADEMIC GOOD STANDING

At the conclusion of each term of enrollment, a student must have earned enough course credits to be in academic good standing.

1. At the end of the first term at Yale, a student must have earned at least four course credits.
2. At the end of the second term, a student must have earned at least eight course credits.
3. At the end of the third term, a student must have earned at least twelve course credits.
4. At the end of the fourth term, a student must have earned at least sixteen course credits.
5. At the end of the fifth term, a student must have earned at least twenty-one course credits.
6. At the end of the sixth term, a student must have earned at least twenty-six course credits.
7. At the end of the seventh term, a student must have earned at least thirty-one course credits.

Regardless of the number of credits accumulated, a student is not in academic good standing if the student's record shows three grades of F in a term or over two or three successive terms. "Successive terms" means successive terms in which the student enrolls, whether or not broken by a withdrawal or by a leave of absence. See "Dismissal for Academic Reasons" and "Makeup of Course Deficiencies for Promotion or Academic Good Standing" in section I, Academic Penalties and Restrictions.

E. Registration and Enrollment in Courses

REGISTRATION

All students are required to register, and to create a preliminary online course schedule as described under "Enrollment in Courses," below, at the beginning of each term in which they are to be enrolled in courses at Yale College.

1. **Fall-term registration** To register for the fall term, all first-year students must attend a registration meeting with their residential college dean and first-year counselor on the Friday before classes begin, as published in the Yale College Calendar with Pertinent Deadlines. Upper-level students must attend the registration meeting conducted by the office of the residential college dean on the day before classes begin, as published in the Yale College Calendar with Pertinent Deadlines. Students whose registration is being temporarily withheld by the Office of Student Financial Services or by any other administrative office of the University are nonetheless required to attend the appropriate registration meeting.
2. **Spring-term registration** To register for the spring term, first-year students are required to attend a registration meeting in their residential college on the day before classes begin, as specified in the Yale College Calendar with Pertinent Deadlines. Sophomores, juniors, and seniors are required to pick up registration materials from the office of the residential college dean on the first day of classes, as specified in the Yale College Calendar with Pertinent Deadlines. Students

whose registration is being temporarily withheld by an administrative office of the University are nonetheless required to report for spring-term registration as indicated immediately above.

3. **Late registration** A student who, for reasons other than an incapacitating illness or incapacitating condition of any kind, the death of a family member, or a comparable emergency, fails to follow the registration procedures in paragraph 1 or 2 above may register for the term only by exceptional action of the Committee on Honors and Academic Standing and will be liable for a fine of \$50.

ENROLLMENT IN COURSES

Students may enroll in courses only by submitting an approved course schedule or, if amending the course schedule, by submitting an approved course change notice. Attendance at a class does not constitute enrollment. The course schedule is an important document. A student is responsible for the timely submission of the course schedule and for the accuracy of all the information that the student enters upon it. The course elections that a student indicates on a course schedule or course change notice will appear on the student's transcript unless the student formally withdraws from a course before the relevant deadline, as listed in the Yale College Calendar with Pertinent Deadlines. See section F, Withdrawal from Courses.

The following rules govern students' enrollment in courses during the fall and spring terms of the academic year:

1. **Preliminary online course schedule** In both fall and spring terms, all students must create a preliminary course schedule in Online Course Selection (OCS) by 11:59 p.m. on the day before classes begin. Students who fail to submit a preliminary schedule by the deadline will be charged a fine of \$50. The preliminary course schedule must contain at least three course credits. Students are expected to edit their online course schedules regularly during the course selection period, retaining courses they are actively considering and removing courses in which they do not plan to enroll.
2. **Deadline for submitting final schedules** Every student must submit a final course schedule for each term at the office of the residential college dean by 5 p.m. on the deadline indicated on the student's course schedule and listed in the Yale College Calendar with Pertinent Deadlines. Students whose registration has been withheld by the Office of Student Financial Services or any other administrative office of the University must nonetheless submit their course schedules by these same deadlines. It is the student's responsibility to obtain all necessary signatures, except that of the residential college dean, before the schedule is due. In the rare instance that the student's adviser is unavailable before the deadline, the student should nonetheless submit the schedule on time, and take a copy to be signed by the adviser and submitted to the dean as soon as possible. If the student does not submit a copy of the schedule signed by the adviser within one week of the deadline, the student will be subject to the fines and restrictions described under paragraphs 4 and 5 below.
3. **Addition of a new course after the deadline** The election of a new course after the deadline for submitting a course schedule will not be permitted save by exceptional action of the Committee on Honors and Academic Standing. Students who seek such an exception should consult immediately with the residential college

dean. Permission to elect a new course must be requested by a petition that is accompanied by the written approval of the course instructor and the submission of a course change notice at the office of the residential college dean. The petition should explain in detail why the course is necessary to the student's schedule and why the student was unable to elect the course during the course selection period. Timeliness is an essential feature of any request to add a course to the course schedule; a delay in consulting with the dean or in submitting a complete petition will normally be grounds for denial. A fee of \$20 will be charged for the processing of an approved course change notice on which the election of a new course is requested. A student may not elect a new course after midterm, as published in the Yale College Calendar with Pertinent Deadlines, unless such election is made to correct a clerical error on the course schedule. A change of level in courses in which the subject is taught in an ordered progression, as for example in languages or in mathematics, is not considered the addition of a new course. Such a change may be made with the approval of the instructors involved (and, if necessary, with the added permission of the director of undergraduate studies in the subject). Similarly, a change of section in the same course is not considered the addition of a new course.

4. **Fines for late schedules** Students who submit their schedules after the deadlines will be fined at least \$50. Additional fines, increased \$5 daily according to lateness, will be imposed for schedules submitted more than one week after the deadlines. A schedule received more than two weeks after it is due will be accepted only by exceptional action of the Committee on Honors and Academic Standing and will be subject to an increased fine or other penalty.
5. **Fines for clerical errors** A student who submits a course schedule or course change notice with clerical errors or omissions of data is liable to a fine of \$50.
6. **Overlapping meeting times** A student may not elect courses with meeting times that overlap. If, for good cause, a student is obliged to elect two courses with a small and insignificant overlap in meeting times, the student must supply the residential college dean with the written permission of both instructors at the beginning of the term and must petition the Committee on Honors and Academic Standing, explaining why the student must enroll in both courses in the current term and how the student will meet all the requirements for both courses. Failure to file a complete and timely petition may result in the loss of credit for both courses.
7. **Courses requiring permission** Some courses require permission of the instructor to enroll; others require permission of the director of undergraduate studies. It is the responsibility of the student to secure the appropriate permission before enrolling in a course.
8. **Courses that do not require permission** Courses that do not require permission for enrollment may nevertheless be limited in their enrollment (i.e., "capped") at the beginning of the term, depending upon, for example, the number of teaching assistants available, the size of the appropriate meeting space, or other instructional needs.
9. **Prerequisites** Students are expected to have met the prerequisites published in course descriptions. If a student wishes to elect a course for which prerequisites are indicated but has not met those prerequisites, it is the student's responsibility to secure the permission of the instructor and, where appropriate, the director of

undergraduate studies before enrolling. The registrar may drop the student from the class if the student has not met the prerequisites for enrollment.

10. **Teaching evaluations** For the advancement of teaching in Yale College, anonymous teaching evaluations are made available through the Yale Student Information System (SIS). Students are expected to participate in this evaluation process for any Yale College course in which they are enrolled. Students who withdraw from a course after midterm are invited but not required to participate.
11. **Selection of a less advanced course in the same subject** In certain subjects, such as mathematics, foreign languages, and the sciences, knowledge of the subject is acquired in an ordered progression. That is, the concepts and skills introduced in one course are necessary, or prerequisite, for mastery of the material in subsequent courses in that field. Occasionally a student, having completed an intermediate or advanced course in a subject, may take a less advanced one in that same subject. In such a case, although the student obviously cannot receive course credit for both courses, each course will appear on the student's transcript with the grades earned; however, the student will receive course credit only for the more advanced course. A student may sometimes be permitted to complete an intermediate or advanced course without having first completed a less advanced course in a subject; in such a case, the student does not receive course credit for the less advanced course by virtue of having completed the more advanced course.
12. **Repeated enrollment in the same course** Courses may not be repeated for credit, except for courses marked "May be taken more than once" or "May be repeated for credit." In such cases, the repeated course earns no additional distributional credit. On rare occasions, a student may take the same course over again, or may take a course with the same content as another course the student has already passed. In such cases, the student receives credit for the course only once. Should a student take the same or an equivalent course twice, each course with its grade appears on the transcript. The student receives course credit for the higher grade if one is earned; in such an event, course credit is not given for the lower grade. Note, however, that both grades are included in the calculation of a student's grade point average (GPA) and in the calculation for General Honors.
13. **Placement in foreign language courses** Students placed by a language program or by their score on the Advanced Placement examination into a particular level of a foreign language may not earn course credit for the completion of a course in that language at a level lower than the placement. For example, a student placed into the third term (L3) of a foreign language earns no course credit for the completion of an L1 or L2 course in that language. Should a student complete a foreign language course at a level lower than the placement, the lower-level course with its grade appears on the transcript but earns no credit toward graduation.
14. **Use of vertebrate animals** If the satisfactory completion of a course will require the use of vertebrate animals in experiments, the student must be notified of that requirement at the first meeting of the course. If a student objects on ethical grounds to participating in the animal usage in question, it is the student's responsibility to discuss the matter with the faculty member in charge and not to enroll in the course if no alternative acceptable to the faculty member can be arranged.

15. **Field trips** If the satisfactory completion of a course will require participation in a field trip, students should understand that there are inherent risks, including the risks of travel, involved in such an activity. If a student objects to assuming these risks, it is the student's responsibility to discuss the matter with the faculty member in charge and not to enroll in the course if no alternative acceptable to the faculty member can be arranged. Yale College's policies regarding field trips can be found at the Yale College Academic Field Trip Policies website.
16. **Fieldwork** If a student is conducting fieldwork away from the Yale campus, under the supervision of a faculty member, he or she should discuss the inherent risks of such work and pre-departure guidelines with the supervising faculty member or director of undergraduate studies.

F. Withdrawal from Courses

Students are permitted to withdraw from courses for which they have enrolled in a term until 5 p.m. on the last day of classes before the reading period in that term. Withdrawal from a course can be accomplished only by the submission of a course change notice at the office of the residential college dean. A fee of \$20 will be charged for the processing of an approved course change notice on which withdrawal from a course is requested. Formal withdrawal is important, because failure to receive credit for courses in which students are enrolled will be recorded as F on their transcripts and may open them to the penalties described in section I, Academic Penalties and Restrictions, "Academic Warning" and "Dismissal for Academic Reasons."

1. **Transcripts** Each course listed on a student's course schedule appears on the student's transcript unless the student withdraws from the course by midterm. See paragraph 3, below.
2. **Permission** All course withdrawals require the permission of the residential college dean.
3. **Deadlines for withdrawal from courses** If a student formally withdraws from a full-term course by midterm, as published in the Yale College Calendar with Pertinent Deadlines, then after the registrar has recorded the withdrawal, the transcript will contain no indication of that course. If a student formally withdraws from a half-term course by the relevant deadline published in the Yale College Calendar with Pertinent Deadlines, then after the registrar has recorded the withdrawal, the transcript will contain no indication of that course.

If a student formally withdraws from a full-term course after midterm but before 5 p.m. on the last day of classes before the reading period, the transcript will record the course and show the neutral designation W (Withdrew) for the course. If a student enrolled in a half-term course formally withdraws from it after the deadline for the course to be removed from the transcript, but by the last date a withdrawal is permitted from the course, the student's transcript will record the neutral designation W (Withdrew) for the course. See the Yale College Calendar with Pertinent Deadlines for both dates in each term. The deadlines apply to all courses, whether or not a particular course observes the reading period.

A change of level in courses in which the subject is taught in an ordered progression, as, for example, in foreign languages or in mathematics, is not considered a course withdrawal and does not result in the recording of a W.

After these deadlines, withdrawal from a course is not permitted. An exception will be made only for a student who withdraws from Yale College for medical reasons as certified by Yale Health after the beginning of the reading period but by the last day of the final examination period; in such a case the student will be permitted to withdraw from a course with a mark of W.

4. **Withdrawal from a credit/year sequence** For those credit/year course sequences in which a student receives the mark of SAT or NSAT for the first term and a letter grade for the second, withdrawal from the sequence after the first term is completed but before the second term is completed will result in the recording of a mark of W for the first term.
5. **Lack of formal withdrawal** If, when grades are due, the instructor of a course notifies the registrar that a student has not successfully completed a course from which the student has not formally withdrawn, then a grade of F will be recorded for that course on the student's transcript. See section B, Grades, "General Regulations Concerning Grades and Transcripts." See also section H, Completion of Course Work, "Work Incomplete at the End of Term" and "Postponement of Final Examinations."
6. **Withdrawal from Yale College** A student who has withdrawn from Yale College for any reason, including medical, is no longer enrolled. Consequently, as of the date of the withdrawal, such a student cannot continue to attend classes or complete work that was assigned in the term in which the withdrawal occurred, even if the deadline for such assignments was previously extended by the instructor or by the residential college dean.
7. **Transcripts of students withdrawn from Yale College** It follows that if a student withdraws from Yale College by midterm, the transcript will not show that the student has been enrolled in any course during that term. If a student withdraws from Yale College after midterm, but before 5 p.m. on the last day of classes before the reading period, the transcript will record the student's courses with the designation W (Withdrawn). If a student withdraws from Yale College after the beginning of the reading period, the transcript will show the student's courses with grades of F unless an instructor reports a passing grade for the student in any of the courses. The only exception is for a student who withdraws from Yale College for medical reasons after the beginning of the reading period but before the end of the term; see paragraph 3, above.

G. Reading Period and Final Examination Period

1. **Due dates for course work** It is expected that instructors will require all course assignments, other than term papers and term projects, to be submitted at the latest by the last day of reading period. Term papers and term projects are to be submitted at the latest by the last day of the final examination period. For the dates of the reading period and final examination period, consult the Yale College Calendar with Pertinent Deadlines. Instructors do not have the authority to give permission for these deadlines to be extended; only the residential college dean has this authority. See section H, Completion of Course Work, "Work Incomplete at the End of Term." Even if an extended deadline should be announced by the instructor, a grade

reflecting work submitted after the end of the term cannot be accepted unless a Temporary Incomplete was authorized by the student's residential college dean.

2. **Reading period** The Yale College Faculty established the reading period between the end of classes and the beginning of final examinations in order to provide a period of about a week during which students might conclude their course work and prepare for final examinations. The instructor of each course determines whether or not that course observes the reading period. A course that does not observe the reading period is identified in the course listings by the abbreviation "RP" at the end of the course description or by a phrase such as "Meets RP" or "Meets during reading period."

The assumption underlying the faculty's institution of the reading period was that no additional assignments would be required during the reading period in a course observing it, but that students would use the reading period in their own way to consolidate and augment the work of the course. Such being the case, no final examination may be administered during the reading period. A final examination in a course, whether or not the course observes the reading period, must be administered during the final examination period. No take-home final examination may be due during the reading period. An instructor may, however, set the due date for a term paper or project during the reading period.

3. **Final examinations** Yale College expects every course to conclude with a regular final examination or with a substitute for such an examination. The substitute should be in the nature of a final examination in that it requires the student to demonstrate proficiency in the discipline and subject matter of the course. Substitutes may include, for example, an oral presentation or examination, a term essay, or the last of a series of hour tests administered during the last week of classes. Final examinations normally last either two or three hours but, in either case, students are permitted to take an additional half-hour before being required to turn in their answers. This additional time is given for improving what has already been written, rather than for breaking new ground.
4. **Scheduling of final examinations** The University Registrar's Office has assigned a specific time and date for the administration of final examinations in most courses in Yale College. The time of the final examination is determined by the meeting time of a course during the term. If the meeting time of a course is changed from that originally published, the time of the examination is defined by the new meeting time. If a course is published with no scheduled examination but the instructor subsequently decides to offer a final examination, it must be administered at the time defined by the meeting time of the course. The schedule of final examinations may be found in General Information under the heading Final Examination Schedules.
5. **Date of administering final examinations** Since the final examination schedule has been carefully designed to make efficient use of the entire final examination period and to minimize overcrowding of students' schedules, a final examination must be administered on the date and at the time specified. On occasion instructors have administered final examinations at times different from those assigned. Such an arrangement is allowed under the following conditions: (a) that two different and distinct final examinations be administered; (b) that one of these examinations be administered at the regularly specified time within the final examination period; (c)

that the alternative examination be administered at a regular examination starting time during the final examination period; and (d) that no student be required to obtain permission to take the alternative examination.

6. **Take-home final examinations** Take-home final examinations are sometimes substituted for regular final examinations. If a course has been assigned a final examination date, a take-home examination for that course is due on the scheduled examination day. If a course has not been assigned a final examination date, a take-home examination for the course is due on the day specified in the final examination schedule by the meeting time of the course. See Final Examination Schedules. If a course does not meet at a time covered by the final examination schedule, a take-home examination may not be due during the first three days of the final examination period. No take-home examination may be due during the reading period.

7. **Due dates for term grades** An instructor is required to submit term grades promptly after the completion of a course. For due dates, consult the Yale College Calendar with Pertinent Deadlines.

In submitting term grades, the instructor is expected to apply appropriate penalties for missed or incomplete work unless the late submission of the work has been authorized by the student's residential college dean or by the Committee on Honors and Academic Standing. If an instructor reports a mark of Incomplete for which there has been no authorization by the college dean, the Incomplete will be recorded by the University Registrar's Office as a grade of F.

8. **An hour test at the end of term instead of a final examination** Some instructors do not give final examinations of the usual two-and-one-half-hour or three-and-one-half-hour length, but instead terminate their courses with an hour test that is the last in a succession of hour tests administered during the term.

For courses that do not observe the reading period, this hour test may be administered during the reading period, since, in such courses, regular class meetings are scheduled to extend through the reading period. A course that does not observe the reading period may also administer the hour test during the final examination period at the time specified in the final examination schedule.

For courses that do observe the reading period, the hour test may not be administered during the reading period, but may be administered only during the last week of classes or during the final examination period at the time specified in the final examination schedule.

9. **Senior departmental examinations** In those major programs requiring a senior departmental examination, that examination is scheduled on the two weekdays preceding the final examination period in the fall and spring terms. In a department or program in which a two-day written senior departmental examination is administered on those days, a senior may, with the written consent of the appropriate instructors, be excused from final examinations in as many as two courses in the major in the term in which he or she takes the departmental examination. In a department or program in which the senior departmental examination takes place on only one of the two scheduled days, a senior may, with the written consent of the instructor, be excused from the final examination in one course in the major in the term in which the departmental examination is taken. If

the senior departmental examination takes place before the scheduled days, or if a senior essay or senior project takes the place of the examination, a student may not omit a final examination.

H. Completion of Course Work

SUBMISSION OF COURSE WORK TO INSTRUCTORS

Students in Yale College are expected to take personal responsibility for the timely delivery to their instructors of all course work, including examinations, in the manner and format prescribed by the instructors. In-person submission, either to the instructor or to someone explicitly designated by the instructor, such as a teaching fellow or an administrative assistant, is always the best way to ensure that the work has been received. Students who submit course work in a manner other than in person and directly to an appropriate individual (e.g., place it under a door or in a box in a hallway or send it via electronic means), should—even when that is the method directed by the course instructor—confirm as soon as possible after the submission that the work has been received. Students who must use postal services to submit a course assignment, because they will be unavoidably absent from campus at the time an assignment is due, should ascertain in advance from the instructor the correct mailing address and use receipted mail services to establish the date of mailing.

Instructors are not required to accept course work sent over a computer network to their computer, printer, or email account unless they have explicitly authorized such electronic submission in the course syllabus or have made a special arrangement with the student. Instructors may establish a deadline for electronic submission of a particular assignment different from the deadline for submission of the same assignment on paper.

LATE OR POSTPONED WORK

There are three kinds of late or postponed work: (1) work late during term time; (2) work incomplete at the end of term; and (3) postponed final examinations. Instructors of courses may, during term time, give permission to make up late or missed work, provided that such work is submitted before the end of term. Only the residential college dean, however, may authorize the late submission of work still incomplete at the end of term, or the postponement of a final examination.

When students know in advance that they must miss or postpone work for a legitimate reason, as described in “Work Missed During the Term” and in “Postponement of Final Examinations” below, they should inform the instructor and the residential college dean as soon as possible.

WORK MISSED DURING THE TERM

The basic responsibility for permitting postponement of work during the term rests with the instructor. However, the residential college dean may give permission for a student to make up work missed or delayed during the term because of an incapacitating illness or incapacitating condition of any kind, the death of a family member, or a comparable emergency. The residential college dean also has authority to give permission to make up work missed because of the observance of religious holy days and because of participation required in intercollegiate varsity athletic events. Only

in these cases does a residential college dean have authority to give permission to make up late work during term time. This permission is conveyed by means of a special form from the college dean that the student delivers to the instructor. Students participating in events of intramural or club sports, as differentiated from varsity events sponsored by the Department of Athletics, are not eligible for a postponement of work by the dean on account of those events.

In all other cases of work missed during the term, permission to make up course work must be secured directly from the instructor of the course, since the instructor is the only person who can decide, in the context of the nature and requirements of the course, whether such permission is appropriate. This permission may not, however, extend beyond the end of the term. Permission to submit work still incomplete at the end of term may be granted only by a student's residential college dean. See "Work Incomplete at the End of Term" below.

WORK INCOMPLETE AT THE END OF TERM

Only the residential college dean has authority to give permission to a student to submit work in a course after the end of term. The college dean may give such permission because of an incapacitating illness or incapacitating condition of any kind, because of a serious family emergency, or because of another matter of comparable moment. In such cases, the college dean may authorize a mark of Temporary Incomplete for a period not to exceed one month from the beginning of the final examination period. Note that the mark of Temporary Incomplete refers to unfinished course work that was originally due in the closing weeks of the term, and not to assignments (such as lab reports, problem sets, reading responses, etc.) originally due prior to the last day of classes. Note also that the mark of Temporary Incomplete does not refer to a final examination missed for any reason; see "Postponement of Final Examinations" below.

The residential college dean, in authorizing a mark of Temporary Incomplete, will stipulate the date on which the student's late work will be due and the date on which the instructor is expected to submit a course grade to the registrar. The college dean may not set this second date later than one month after the beginning of the final examination period. If the student's work has not been completed in time for the instructor to report a grade to the registrar by the deadline stipulated, then the instructor will submit a grade for the student that reflects the absence of the missing work, or the registrar will convert the mark of Temporary Incomplete to a grade of F. See section B, Grades, "General Regulations Concerning Grades and Transcripts," and section F, Withdrawal from Courses.

Permission for a mark of Temporary Incomplete to last beyond one month from the beginning of the final examination period can be granted only by the Yale College Committee on Honors and Academic Standing. Such an extension may be given only for a brief period of time, usually one to two weeks, and only in response to extraordinary circumstances, usually of a medical nature. A petition for such permission must be submitted at the earliest possible date. In considering such requests, the Committee on Honors and Academic Standing takes into account the original deadline for submission of the work and the date on which a petition is delivered to the committee.

USE OF COMPUTERS AND POSTPONEMENT OF WORK

Problems that may arise from the use of computers, software, and printers normally are not considered legitimate reasons for the postponement of work. A student who uses computers is responsible for operating them properly and completing work on time. (It is expected that a student will exercise reasonable prudence to safeguard materials, including backing up data in multiple locations and at frequent intervals and making duplicate copies of work files.) Any computer work should be completed well in advance of the deadline in order to avoid last-minute technical problems as well as delays caused by heavy demand on shared computer resources in Yale College.

POSTPONEMENT OF FINAL EXAMINATIONS

Only the residential college dean may authorize postponement of a final examination. The residential college dean may give such permission because of an incapacitating illness or incapacitating condition of any kind, because of a family emergency requiring the student's absence from New Haven, or because of another matter of comparable moment. The residential college dean may also authorize such a postponement because of the observance of religious holy days, or because of participation required in an intercollegiate varsity athletic event. Students participating in events of intramural or club sports, as differentiated from varsity events sponsored by the Department of Athletics, are not eligible for a postponement of final examinations on account of those events. Finally, the college dean may authorize postponement of a final examination if a student has three examinations scheduled during the first two full days of the final examination period, or three examinations scheduled consecutively in the final examination schedules.* The postponement of a final examination for any other reason requires the permission of the Committee on Honors and Academic Standing. A student's end-of-term travel plans are not a basis for the postponement of a final examination. See Final Examination Schedules and section G, Reading Period and Final Examination Period, paragraph 4.

* The final examination schedules indicate three examination sessions, or time slots, per day: one in the morning, one in the afternoon, and one in the evening. Some of these time slots contain examinations; others do not. A college dean may postpone an examination if a student has three examinations scheduled within any four consecutive time slots, whether or not each of those time slots has an examination assigned to it. See Final Examination Schedules. Occasionally an instructor may arrange an option for an alternative final examination in addition to the regularly scheduled examination. See section G, Reading Period and Final Examination Period, paragraph 5. Such an optional arrangement cannot be the basis for a postponement of an examination if three of a student's final examinations would thereby acquire "consecutive" status.

It is normally the expectation that when a student begins a final examination but does not complete it, the student will receive credit only for the work completed on the examination. If, however, a student becomes unable to complete an examination because of a sudden and serious illness or other emergency during the examination, the student may request authorization from the residential college dean to take a makeup final examination. In such a case, the student must explain his or her departure to the instructor, or to some other person proctoring the examination, before leaving the

room, and must contact Yale Health or the residential college dean as soon as possible thereafter.

Makeup examinations for the fall term are scheduled to take place at the end of the second week of classes in the spring term. Makeup examinations for underclass students who miss final examinations in the spring term are scheduled at the end of the second week of classes in the following fall term. Makeup final examinations are administered by the University Registrar's Office only at these times. Students who will not be enrolled at these times—whether because they are on leave of absence or on a Year or Term Abroad, or because they have withdrawn from Yale—must make alternative arrangements with the University Registrar's Office in advance of the dates on which makeup final examinations are administered by that office. The registrar automatically records a grade of F in a course for a student who fails to take an officially scheduled makeup examination in that course at the appointed time. If an examination is not administered by the registrar, it is the student's responsibility to make arrangements with the instructor to take the makeup examination. In such cases, if a grade is not received by the midterm following the original examination date, the registrar automatically records a grade of F in the course.

No fee will be charged for a makeup examination necessitated by illness, family emergency, the observance of a religious holy day, or participation required in an intercollegiate varsity athletic event. A charge of \$35 will be made for the administration of a makeup examination occasioned by a conflict between two final examinations scheduled at the same time, or three examinations scheduled in the first two days of the examination period, or three final examinations scheduled in consecutive examination periods. Ordinarily there will be a charge of \$35 for makeup examinations authorized for special reasons approved by the Committee on Honors and Academic Standing.

Permission to postpone a final examination does not authorize a student to submit other work late in that course. See "Work Incomplete at the End of Term" above.

I. Academic Penalties and Restrictions

CUT RESTRICTION

Regular classroom attendance is expected of all students. While Yale College enforces no general regulation concerning attendance, instructors of individual courses may require it of all students. This is particularly the case in discussion groups, seminars, laboratories, and courses in foreign languages.

A student who, in the opinion of the instructor and of the residential college dean, has been absent from a course to an excessive degree and without excuse may at any time be placed on Cut Restriction in that course or in all courses. A student on Cut Restriction who continues to be absent from a course may, with the concurrence of the college dean and the Committee on Honors and Academic Standing, be excluded from it without credit. See "Exclusion from Courses" below.

EXCLUSION FROM COURSES

Any student may, because of excessive absences or unsatisfactory work, be excluded from a course without credit at any time upon the recommendation of the instructor or department concerned to the residential college dean and the Committee on Honors

and Academic Standing. If the exclusion occurs after midterm and before the first day of the reading period, the student's record will show a mark of W for the course.

ACADEMIC WARNING

Academic Warning is an indication that a student's scholastic record is unsatisfactory. Students on Academic Warning who do not pass all of their courses in the term in which they are on Academic Warning will be dismissed for academic reasons. No matter how many course credits a student has earned, Academic Warning is automatic in the following cases: (a) failure in one term to earn more than two course credits; (b) a record that shows two grades of F in one term; (c) in two successive terms, a record that shows a grade of F for any course. The college deans attempt to give written notification of Academic Warning to students whose records show these deficiencies, but such students should regard themselves as being on warning even in the absence of written notification. A student permitted to continue in Yale College with fewer than the number of course credits ordinarily required for academic good standing may be placed on Academic Warning, and in such a case the student will be notified that he or she has been placed on warning. See section D, Promotion and Good Standing, "Requirements for Academic Good Standing." The Committee on Honors and Academic Standing may at its discretion disqualify a student on Academic Warning from participation in recognized University organizations.

DISMISSAL FOR ACADEMIC REASONS

1. **Failure in three classes** A record that shows three grades of F in a term or over two or three successive terms will normally result in the student's dismissal from Yale College. "Successive terms" means successive terms in which the student enrolls, whether or not broken by a withdrawal or by a leave of absence. While Yale Summer Session grades are recorded on the Yale College transcript, they are not counted towards this total, because attendance at Yale Summer Session does not constitute a term of enrollment in Yale College.
2. **Failure to meet requirements for good standing or promotion** A student who has not, at the end of a term, met the minimum requirements for academic good standing, or a student who has failed to meet the minimum standards for promotion, may be dismissed unless permitted by the Committee on Honors and Academic Standing to repair the deficiency. See section D, Promotion and Good Standing, and "Makeup of Course Deficiencies for Promotion or Academic Good Standing" below. A student who is short by more than two credits of the minimum requirements for academic good standing or promotion, even if the student has no grades of F, will be dismissed.
3. **Students on Academic Warning** A record that shows a grade of F for a student who is on Academic Warning in that term will result in that student's dismissal for academic reasons. See "Academic Warning" above.
4. **Reinstated students** A student reinstated to Yale College who does not, in the first or second term following reinstatement, pass all the courses completed in that term will be dismissed for academic reasons. See section J, Leave of Absence, Withdrawal, and Reinstatement, "Reinstatement." In addition, at any point during the year a student may be dismissed from Yale College if in the judgment of the

Yale College Committee on Honors and Academic Standing the student's academic record is unsatisfactory.

MAKEUP OF COURSE DEFICIENCIES FOR PROMOTION OR ACADEMIC GOOD STANDING

A student who has failed to satisfy the requirements for promotion or for academic good standing, if permitted to continue by the Committee on Honors and Academic Standing, must repair the deficiency promptly. Such deficiencies are to be repaired before the opening of the next fall term by work in summer school. The institution to be attended and the courses to be taken require the approval of the residential college dean. See section P, Credit from Other Universities. Only in extraordinary circumstances will a student be allowed to repair a deficiency by carrying an additional course during the following academic year. Course deficiencies may not be repaired under any circumstances by the application of acceleration credits.

J. Leave of Absence, Withdrawal, and Reinstatement

LEAVE OF ABSENCE

Any student in Yale College who is in academic good standing will normally receive permission, upon petition to the Committee on Honors and Academic Standing through the residential college dean, to take one or two terms of leave of absence, provided that the student departs in academic good standing at the end of a term and returns at the beginning of a term. See section D, Promotion and Good Standing, "Requirements for Academic Good Standing." In order that the University may make plans to maintain enrollment at the established level, students desiring leaves of absence are requested to make their intentions known to their residential college deans as soon as possible. Yale College assumes that students who take leaves of absence will inform their parents or guardians in good time that they intend to do so. Ordinarily, residential college deans do not notify parents or guardians that a student has taken a leave of absence, though they may do so if they believe that such notification is appropriate.

1. **Petition for a fall-term leave** For a fall-term leave of absence, a student is requested to submit a petition by May 1. Since a student's plans often change during the summer, however, the Committee on Honors and Academic Standing will ordinarily grant a petition for a leave that is received on or before the fifteenth day of the term in the fall.
2. **Petition for a spring-term leave** For a spring-term leave of absence, a student's petition must be received on or before the fifteenth day of the term in the spring.
3. **Relinquishing housing** Students considering a leave of absence should be aware that there is a substantial financial penalty for relinquishing on-campus housing after the relevant deadlines for relinquishing such housing. See "Rebates of Undergraduate Charges" under "Financial Services" in the Yale College online publication *Undergraduate Regulations*.
4. **Canceling a leave** A student may cancel a leave of absence for either term as late as the first day of classes in the term for which the leave has been requested. However,

the deadlines for payment of the term bill and the penalties for late payment apply in such cases. See “Payment of Bills” under “Financial Services” in the Yale online publication *Undergraduate Regulations*.

5. **Total terms of leave** A student is eligible for a total of two terms of leave of absence. These two terms need not be taken consecutively.
6. **Accelerated students** A student taking an accelerated degree by use of acceleration credits who has had two terms of leave of absence may receive a third term of leave if the third term of leave is needed to bring the student’s pattern of attendance into conformity with the pattern of attendance stipulated for an accelerated degree. See section Q, Acceleration Policies.
7. **Returning from a leave** Permission to take a leave of absence normally includes the right to return, with prior notification to the residential college dean but without further application, at the beginning of the term specified in the student’s petition to the Committee on Honors and Academic Standing. In the case, however, in which a student achieved eligibility for a leave of absence because of a postponement of a deadline for course work as a result of an identified medical problem, the Yale College Dean’s Office may require medical clearance from Yale Health before the student’s return from the leave of absence. Such clearance may also be required for a student who had sought and had been granted, on medical grounds, a waiver of the fee for the late relinquishment of housing at the time the leave of absence was requested.
8. **Financial aid** Students taking leaves of absence who have received long-term loans will be sent information about their loan repayment obligations, which in most cases begin six months after the last day of formal enrollment at Yale. A student taking a leave of absence who is receiving financial aid through Yale must consult with a counselor in Student Financial Services before leaving Yale; see “Rebates of Undergraduate Charges” under “Financial Services” in the Yale online publication *Undergraduate Regulations*.
9. **Health coverage** A student on a leave of absence is eligible to retain coverage by Yale Health during the time of the leave, but the student must take the initiative to apply for continued membership in Yale Health by completing an application form and paying the fee for membership. See “Leave of Absence” under “Health Services” in the Yale online publication *Undergraduate Regulations*. Application forms and details about medical coverage while on leave of absence may be obtained from the Member Services Department of Yale Health.

WITHDRAWAL

There are five types of withdrawal, three of which—academic, medical, and personal—are discussed below. For information on disciplinary and financial withdrawals, consult the Yale online publication *Undergraduate Regulations*. The period of withdrawal for disciplinary reasons is imposed by the Yale College Executive Committee or recommended by the University-Wide Committee on Sexual Misconduct at the time the student’s enrollment is suspended.

Regardless of the type of withdrawal, students who have been withdrawn may not stay in residences on campus, attend classes, participate in organized extracurricular activities, or make use of University library, athletic, and other facilities. They may

come to campus only upon receiving prior permission from their residential college dean or the Dean of Student Affairs.

ACADEMIC WITHDRAWAL

Students may be dismissed for academic reasons on a variety of grounds; see section I, Academic Penalties and Restrictions, "Dismissal for Academic Reasons." Students whose withdrawal was for academic reasons must remain away for at least one fall term and one spring term, in either order, not including the term in which the withdrawal occurred.

MEDICAL WITHDRAWAL

A withdrawal for medical reasons must be authorized by the director of Yale Health or the chief of the Mental Health and Counseling department, or by their official designees within the Health Center. If a student under the care of a non-Yale Health physician wishes to withdraw for medical reasons, that physician should submit sufficient medical history to the director of Yale Health for a final decision on the recommendation. A student planning to return to Yale should discuss the requirements for reinstatement with the residential college dean or the chair of the Committee on Reinstatement.

Yale College reserves the right to withdraw a student for medical reasons when, on recommendation of the director of Yale Health or the chief of the Mental Health and Counseling department, the dean of Yale College determines that, because of a medical condition, the student is a danger to self or others, the student has seriously disrupted others in the student's residential or academic communities, or the student has refused to cooperate with efforts deemed necessary by Yale Health and the dean to make such determinations. Each case will be assessed individually based on all relevant factors, including, but not limited to, the level of risk presented and the availability of reasonable modifications. Reasonable modifications do not include fundamental alterations to the student's academic, residential, or other relevant communities or programs; in addition, reasonable modifications do not include those that unduly burden university resources. An appeal of such a withdrawal must be made in writing to the dean of Yale College no later than seven days from the effective date of withdrawal. An incident that gives rise to voluntary or mandatory withdrawal may also result in subsequent disciplinary action.

Students whose withdrawal has been authorized as medical by the director of Yale Health or the chief of the Mental Health and Counseling department must normally remain away at least one full term before a return to Yale College, not including the term in which the withdrawal occurred.

WITHDRAWAL FOR PERSONAL REASONS

At any time during the year, a student may withdraw from Yale College for personal reasons. After consulting with the residential college dean, a student wishing to withdraw should write a letter of resignation to the college dean. In consulting with the college dean, a student planning to return to Yale should discuss the requirements for reinstatement. Also, students in academic good standing who fail to register in a term will be withdrawn for personal reasons.

Students whose withdrawal was for personal reasons must remain away for at least one fall term and one spring term, in either order, not including the term in which the

withdrawal occurred. A student who withdraws from Yale College for personal reasons rather than face disciplinary charges that are pending against that student will not be eligible for Yale College reinstatement, re-enrollment, or a Yale College degree until the student's case has been adjudicated by the Yale College Executive Committee or the University-Wide Committee on Sexual Misconduct.

REBATES OF UNDERGRADUATE CHARGES

For information on financial rebates on account of withdrawal from Yale College, consult the section “Financial Services” under “Regulations” in the Yale online publication *Undergraduate Regulations*.

REINSTATEMENT

During the time that students who have withdrawn are away from Yale College, the Committee on Reinstatement expects them to have been constructively occupied and to have maintained a satisfactory standard of conduct.

Further requirements depend to some extent on the circumstances of the withdrawal and its duration. Students who are not in academic good standing, i.e., students who withdrew while a term was in progress or who were dismissed for academic reasons, must ordinarily complete the equivalent of at least two term courses, either in Yale Summer Session or at another college or university, earning grades of A or B. See section I, Academic Penalties and Restrictions. Courses conducted online, whether taken at Yale Summer Session or elsewhere, do not fulfill this reinstatement requirement. In general, such a record of course work is also required of students who withdrew for medical reasons and of any students who have been away from full-time academic work for more than four terms, whether or not they were in academic good standing at the time of their departure, in order to demonstrate that upon return they can satisfactorily complete their academic program. Courses themselves, as well as the institution at which they are taken, should be cleared in advance with the chair of the Committee on Reinstatement. All such course work must be completed no later than the opening of the term to which the student has applied to be reinstated, but no earlier than two years before the date that term begins. Courses completed in fulfillment of reinstatement that are eligible for graduation credit must be applied to the student's Yale College transcript.

While the majority of students who apply for reinstatement do return to Yale College, reinstatement is not guaranteed to any applicant. Since the committee seeks to reinstate only those students who have demonstrated the ability henceforth to remain in academic good standing and thus complete degree requirements within the specific number of terms of enrollment remaining to them, the committee may sometimes advise applicants to defer their return until a time later than the one originally proposed. At the conclusion of each of the two terms following their reinstatement, students are expected to complete and pass all of the courses in which they remained enrolled. Students who fail to meet this condition are ordinarily required to withdraw after their record has been reviewed by the Committee on Honors and Academic Standing.

A student is eligible to be reinstated only once; a second reinstatement may be considered only under unusual circumstances, ordinarily of a medical nature.

For reinstatement to a fall term, applications must be submitted in person or by mail by June 1. For reinstatement to a spring term, applications must be submitted in person or by mail by November 1. These deadlines are strictly enforced.

Frequently Asked Questions are available online to provide additional information about reinstatement procedures as well as contact information for the chair of the Committee on Reinstatement for reinstatement inquiries.

FINANCIAL WAIVERS AND REINSTATEMENT

Students on financial aid who have successfully completed the course requirements for reinstatement *in the summer prior to reinstatement* will be forgiven their Student Income Contribution (SIC) for the subsequent summer. Students may apply for a waiver of the SIC through Yale's Student Financial Services.

Some students require, upon reinstatement in Yale College, a ninth term of enrollment in order to complete their bachelor's degree. Students who receive financial aid and find themselves in such a situation should consult with a counselor in Student Financial Services about possible Federal financial aid implications.

REINSTATEMENT INTERVIEWS

Interviews with members of the Committee on Reinstatement are required of all applicants for reinstatement. The committee may not approve a student's return to Yale College until after the necessary interviews have taken place. These may include individual in-person meetings for any applicant with the chair of the committee and any other member of the committee, including a member of the Yale Health staff. Interviews are normally conducted prior to the beginning of the term to which the student is seeking reinstatement. While the expectation is that these meetings will take place in person, they may be conducted by video teleconference when circumstances warrant. Contact the chair of the Committee on Reinstatement with questions.

As an integral part of the application for reinstatement, students who withdrew for medical reasons must obtain a recommendation from Yale Health. Such a recommendation must come from either the director of Yale Health or the chief of the Mental Health and Counseling department, or from their official designees within the Health Center; no such recommendation can be made in the absence of documentation provided to Yale Health that the student has had successful treatment from an appropriate health clinician.

U.S. MILITARY SERVICE REINSTATEMENT POLICY

Students who interrupt their studies to perform U.S. military service are subject to a separate U.S. military leave reinstatement policy.

In the event that a student withdraws or takes a leave of absence from Yale College on or after August 14, 2008, in order to serve in the U.S. military, the student will be entitled to guaranteed reinstatement under the following conditions:

1. Students must have served in the U.S. Armed Forces for a period of more than thirty consecutive days.
2. Students must give advance written or verbal notice of such service to their residential college dean. In providing the advance notice students do not need to indicate whether they intend to return. This advance notice need not come directly

from the student, but, rather, can be made by an appropriate officer of the U.S. Armed Forces or official of the U.S. Department of Defense. Notice is not required if precluded by military necessity. In all cases, this requirement of giving notice can be fulfilled at the time the student seeks reinstatement, by submitting an attestation that the student performed the service.

3. Students must not be away from the University to perform U.S. military service for a period exceeding five years (this includes all previous absences to perform U.S. military service but does not include any initial period of obligated service). If a student's time away from the University to perform U.S. military service exceeds five years because the student is unable to obtain release orders through no fault of the student, or the student was ordered to or retained on active duty, such students should contact their residential college dean to determine if they remain eligible for guaranteed reinstatement.
4. Students must notify Yale within three years of the end of the U.S. military service of their intention to return. However, students who are hospitalized or recovering from an illness or injury incurred in or aggravated during the U.S. military service have up until two years after recovering from the illness or injury to notify Yale of their intent to return.
5. Students may not have received a dishonorable or bad conduct discharge or have been sentenced in a court-martial.

A student who meets all of these conditions will be reinstated for the following term unless the student requests, in writing, a later date of reinstatement. Any student who fails to meet one of these requirements may still be eligible for reinstatement under Yale's general reinstatement policy but is not guaranteed reinstatement. Upon returning to Yale, such students will resume their education without repeating completed course work for courses interrupted by U.S. military service. They will have the same enrolled status last held and will be in the same academic standing. For the first academic year in which such students return, they will be charged the tuition and fees that would have been assessed for the academic year in which they left the institution. Yale may charge up to the amount of tuition and fees that other students are assessed, however, if veterans' education benefits will cover the difference between the amounts currently charged other students and the amount charged for the academic year in which the student left. In the case of students who are not prepared to resume their studies with the same enrollment status and academic standing as when they left or who will not be able to complete the program of study, Yale will undertake reasonable efforts to help such students become prepared. If, after reasonable efforts, Yale determines that the student remains unprepared or will be unable to complete the program, or Yale determines that there are no reasonable efforts it can take, Yale may deny reinstatement.

K. Special Arrangements

YEAR OR TERM ABROAD

In recognition of the value of international study, Yale College encourages students to spend a term or an academic year studying in an approved program abroad. In order to participate in a Year or Term Abroad, students must have the approval of the Yale College Committee on the Year or Term Abroad and have been accepted into an

approved and accredited study-abroad program. Students on disciplinary probation and leave of absence are not eligible to participate in a Year or Term Abroad.

Students in any major may apply. Please note that a term abroad may be taken only during the second term of the sophomore year or either the first or second term of the junior year, and that a year abroad may be taken only during the junior year. Within the limits of the eligibility requirements given below, other combinations of terms of study abroad may be permitted with the approval of the Committee on the Year or Term Abroad. Students are limited to a total of two terms abroad for full Yale credit and financial aid transfer.

Students must be in academic good standing as a junior or second-term sophomore to begin an approved term or year abroad and be able to return to enrollment at Yale in academic good standing. See section D, Promotion and Good Standing, “Requirements for Academic Good Standing.” Students must also have at least a B average at the time of their application and demonstrate sufficient competence in the language of the host country to do university-level course work. Applicants with a cumulative GPA below 3.0 are asked to submit an additional short essay that addresses their academic performance at Yale and outlines specific strategies for maintaining academic good standing abroad. The transcript should demonstrate progress towards raising the GPA in the semesters before the intended year or term abroad. Applicants should ensure that they meet the GPA requirement of their intended study abroad program(s). Students seeking to study abroad in a country where the primary language is not English are generally expected to take all of their courses in the language of the host country and meet the minimum language requirement. In general, by the time they go abroad, students should have completed the relevant intermediate-level foreign language course (typically a course numbered 140 with an L4 designation) or have demonstrated the equivalent proficiency by examination. Applicants may petition the committee for an exception to eligibility requirements if they believe they have compelling reasons for the exception.

Application forms for a Year or Term Abroad are available on the Study Abroad website of the Center for International and Professional Experience. A complete application includes all of the following: the application form; an approval form from the student’s director(s) of undergraduate studies; an evaluation form from the student’s residential college dean; and a statement concerning the proposed course of study. Students on Yale financial aid must also submit a Year Abroad Budget for Financial Aid Applicants to the appropriate office. Approval from the Yale College Committee on the Year or Term Abroad is contingent upon the student’s acceptance into a program or university abroad. Students must provide a copy of their acceptance letter to the committee before departure.

Applications for permission to study abroad in the spring term of the academic year 2019–2020 are due on October 15, 2019. Applications for study in the fall term of the academic year 2020–2021 or for the full academic year 2020–2021 are due on April 1, 2020.

Applications for programs or universities abroad are available directly from the sponsoring institutions. Information about specific programs and evaluations from past Yale participants are available on the Study Abroad website. Note that application deadlines differ from program to program and usually also differ from the Yale College

committee's deadline. Students are responsible for meeting the deadlines set by the programs they seek to attend, whether those deadlines fall before or after the Yale College committee's deadline.

In selecting programs abroad in which to enroll, students should be aware that such programs vary in quality, and some may not be approved for a Year or Term Abroad. At a minimum, approved programs must involve full-time work at the university level and must be undertaken during the regular academic year at an institution outside the United States. Students should note that programs in the Southern Hemisphere are subject to a different academic calendar, one which extends into the months of June, July, and August. With this exception, summer terms do not qualify as part of a Year or Term Abroad.

Students should choose from the list of designated programs available on the Study Abroad website. Students applying to enroll in programs not on the designated list must meet with a study abroad adviser to discuss the program and submit a petition by the stated deadlines. As part of the petition, students are required to secure DUS support and provide information about the program and course syllabi. The Yale College Committee on the Year or Term Abroad evaluates programs primarily on the quality and structure of their academic offerings. Study abroad advisers are available in the Center for International and Professional Experience to assist students in selecting an appropriate program.

1. **Course credit from a Year or Term Abroad** Students on a Year Abroad who complete a full program of study for the equivalent of two terms of enrollment at Yale may earn up to nine course credits. Students on a Term Abroad who complete a full program of study for the equivalent of one term of enrollment at Yale may earn up to four course credits. What the committee considers a full program of study varies from program to program. Students should consult with the Study Abroad office to ensure that they are enrolled in a full program abroad.

Usually, if the student has consulted with the director of undergraduate studies and a Study Abroad adviser before going abroad, the award of credit upon return from a Year or Term Abroad is routine.

2. **Other course credit from outside Yale** Enrollment in the Year or Term Abroad program is the only arrangement by which students may offer more than two outside credits toward the thirty-six course credits required for the bachelor's degree.* Students receiving credit for a Year Abroad may not apply any other credits from outside Yale toward the 36-course-credit requirement. Students receiving credit for a Term Abroad may apply up to two other course credits from outside Yale toward the 36-course-credit requirement.

Because the maximum number of outside credits allowed is nine, students who have previously transferred one or two outside credits are normally eligible only for one term abroad. Students who wish to take a year abroad, but who are ineligible by virtue of having transferred one or two outside credits may, with the exception noted below†, request that the University Registrar remove such credit from the transcript by petitioning the Committee on Honors and Academic Standing through their dean's office. If that petition is approved, the Registrar will remove the relevant outside course credit, but the course title will remain on the transcript.

Accordingly, this course work may also continue to be applied towards major and distributional requirements.

3. **Evidence of course work** To be awarded credit toward degree requirements, students must submit to the committee such evidence of their achievement as transcripts or other official academic records, wherever possible. Students should also be prepared to provide on their return to Yale copies of all course work, syllabi, and letters from instructors describing the nature and quality of their work.
4. **Grades** No credit will be awarded for a course in which the grade earned was lower than a C or its equivalent in other grading scales. Nor will credit be awarded for a course taken on a Pass/Fail option, if the student had the choice of taking the course for a letter grade.
5. **Distributional requirements and major requirements** In addition to applying credits earned on a Year or Term Abroad toward the 36-course-credit requirement, students may, with appropriate permissions, apply these course credits toward fulfillment of distributional requirements and some of the requirements of their major programs. Instructions on applying such credit toward the distributional requirements are available on the Fulfilling Requirements While Away web page; petitions for credit toward major requirements should be directed to the relevant director of undergraduate studies.
6. **Academic regulations** Because a Year or Term Abroad counts as the equivalent of one or two terms of enrollment in Yale College, the academic regulations of Yale College pertain to enrollment abroad. Students must earn a sufficient number of credits abroad to remain in academic good standing. Failure to do so will result in academic warning or dismissal for academic reasons. See section I, Academic Penalties and Restrictions. Withdrawal from an approved program abroad has the same consequences as withdrawal from Yale College.
7. **Canceling a Year or Term Abroad** Students who have received permission to study abroad but later decide not to do so must notify Yale Study Abroad and their residential college dean in writing of their change of plans, and then either enroll as usual in Yale College or apply for a leave of absence before the deadline. See section J, Leave of Absence, Withdrawal, and Reinstatement. Students should also notify the Study Abroad office. In some cases, such students will have to withdraw from Yale College if the deadline for requesting a leave has passed, or if they have already taken two terms of leave, or if the deadline for enrolling in courses in Yale College has passed. Under no circumstances can a Year or Term Abroad be converted retroactively to a leave of absence. Similarly, a leave of absence cannot be converted retroactively to a Year or Term Abroad.
8. **Enrollment in Yale College after a Year or Term Abroad** After returning from a Year or Term Abroad, students must enroll in Yale College for at least two terms. Students who have accelerated should speak with their residential college dean about the possible need to decelerate. See section Q, Acceleration Policies.
9. **Financial aid** Students who have been approved by the committee to study abroad and who receive financial aid from Yale are eligible for aid while abroad. For information about financial aid support, consult a counselor in the Student Financial Services Center, 246 Church Street, 432-2700.

* Study during the spring term at the Paul Mellon Centre for Studies in British Art in London (Yale in London) is equivalent to enrollment in Yale College and is not considered a Term Abroad. Application to the Yale in London program should be made directly to that office at the Yale Center for British Art. For details, see the British Studies program description.

† Students on promotion hold who employ outside course credits to repair a credit deficiency cannot subsequently have those credits removed from their transcript for any reason and are thus ineligible to take a year abroad.

COMPLETION OF DEGREE REQUIREMENTS AT THE END OF A FALL TERM

Students who at the end of a fall term complete the requirements for graduation may be of three kinds: (1) those who complete such requirements in eight terms of regular enrollment; (2) those who have accumulated thirty-six course credits or more, all earned at Yale, in fewer than eight terms of regular enrollment; and (3) students admitted by transfer to Yale College and students whose admission to Yale College was deferred until a spring term. Note that acceleration credits may not yield a completion of degree requirements at the end of a fall term; see section Q, Acceleration Policies. The following rules apply to students of these three kinds.

1. **Notification by the student** By the day on which the student's course schedule is due in the final term of enrollment, the student must notify the Committee on Honors and Academic Standing through the residential college dean that the fall term will be the student's last term of enrollment. Forms on which to make such notification are available in the offices of the college deans. Notification must include written certification from the student's director of undergraduate studies that the student will have completed all the requirements of the major program by the end of the fall term, and from the student's residential college dean that the student will have fulfilled the distributional requirements by that time. Failure to observe the deadline will result in the students being charged a fine of \$100.
2. **Award of degrees and diplomas** Students who complete degree requirements at the end of a fall term are awarded their degrees and their diplomas at Commencement at the conclusion of the spring term of that academic year and are considered to be members of the class that graduates at that Commencement. General Honors and Distinction in the Major are also awarded at that time. If a student who completes degree requirements at the end of a fall term wishes to participate in the Commencement exercises held in the previous academic year, however, the student may do so with the permission of the residential college head and dean. Such might be the case, for example, for students who because of a leave of absence did not qualify for graduation with the class in Yale College with which they entered as a first year. Such a student would not receive the degree or diploma until the May of the academic year in which degree requirements were completed.
3. **Health coverage** A student whose last term of enrollment is a fall term is eligible, upon application and payment of a fee, for continued coverage by Yale Health during the subsequent spring term, just as if the student were on leave of absence for that term. Such coverage extends to August 31. See section J, Leave of Absence, Withdrawal, and Reinstatement, "Leave of Absence."

TWO MAJORS

A student must petition the Committee on Honors and Academic Standing for permission to complete the requirements of two major programs. Application forms are available from the residential college deans. A student contemplating the completion of two majors should bear in mind that doing so will almost invariably limit the opportunities for a wider distribution of studies over different subjects.

Each major must be completed independently of the other, with no more than two term courses overlapping. Prerequisites in either major are not considered to be overlapping courses. Other than such prerequisites, all courses taken in a major – including those taken in excess of the minimum requirements of the major – are counted in the consideration of overlapping courses unless such courses are in excess of the minimum requirements for both majors. Overlapping courses may not include the senior essay or senior project, unless the essay or project is unusually substantial and represents at least the equivalent of the minimum essay or project requirement of the one major in addition to the minimum essay or project requirement of the other major. If a single senior essay or project is approved for the two majors, no additional overlap in course credits is permitted.

It is not possible to offer as two majors a combined major with one of its component majors. For example, a major in Economics and Mathematics cannot be joined with a second major in either Economics or Mathematics. Similarly, a student completing a major that permits the inclusion of a concentration of courses from another major or program cannot also major in that second major or program. For example, a major in Sociology with Psychology cannot have a second major in Psychology. A Special Divisional Major may not be offered as one of two majors.

A petition for two majors should show clearly how the requirements for each of the two programs will be met, and should include the approval of the appropriate directors of undergraduate studies. The completion of two majors does not result in the award of two degrees; a student who completes a major that leads to the award of the B.A. degree and another major that leads to the award of the B.S. degree may choose the degree to be conferred. A petition to complete the requirements of two majors should be made only after the student's plans are definite, but no later than the due date for course schedules in the student's final term of enrollment. Petitions submitted after this deadline will be accepted only by exceptional action of the Committee on Honors and Academic Standing and will be fined \$50.

A student may not petition for permission to complete the requirements of more than two major programs.

DOUBLE CREDIT FOR A SINGLE-CREDIT COURSE

Two course credits for a course in Yale College normally carrying one course credit may be awarded to a student under the following conditions:

1. **Deadline** Permission must be requested by midterm, as published in the Yale College Calendar with Pertinent Deadlines.
2. **Petition and approvals** The student's petition must be approved by the instructor of the course, the director of undergraduate studies in the instructor's department, and the Committee on Honors and Academic Standing. The petition should

include a detailed syllabus and an explanation of how the student's proposed work represents at least twice the normal expectations of the course.

3. **Distributional requirements** When a petition for double credit is approved for a course that fulfills a distributional requirement, the additional credit may not be applied toward the distributional requirement, although it may be applied toward the 36-course-credit requirement for graduation.
4. **Multiple courses** A student may make use of this arrangement rarely, and no more than once or twice.

SPECIAL TERM COURSES

With the approval of the Yale College Committee on Honors and Academic Standing, a student may arrange with a member of the faculty to take a Special Term Course, or individual tutorial, for credit toward the bachelor's degree, provided that certain requirements are met. First, the material of the proposed course must be appropriate to the qualifications of the student and it must be otherwise unavailable in the Yale University curriculum. If the subject can be pursued through independent study in an existing tutorial course in a department (e.g., AMST 471 or CGSC 473), the student must apply for enrollment in that course through the director of undergraduate studies. Second, the instructor of the proposed special course must hold a teaching appointment in the University. Third, the student must describe in detail the nature of the proposed course work and submit a syllabus.

Requests for Special Term Courses should be made to the Committee on Honors and Academic Standing, 25 SSS, on forms available from the residential college deans. The application form must be completed by the student and then approved and signed by the proposed instructor and the director of undergraduate studies of the instructor's department. A request for a Special Term Course should be made during the term immediately preceding the term during which the course is actually to be taken. An application will not be accepted by the committee after the second week of the term for which a course is proposed. It is expected that Special Term Courses will be taken for a letter grade. A student may not apply credit earned in a Special Term Course toward satisfaction of any of the distributional requirements.

LIMIT ON RESIDENTIAL COLLEGE SEMINARS

The number of residential college seminars is limited and the demand for them is great. A student may therefore take no more than four residential college seminars, and no more than two in a single term. Permission to exceed these limits must be secured in advance from the Yale College Committee on Honors and Academic Standing; such permission will be given only if the student can demonstrate that the integrity or coherence of the student's academic objectives would suffer without it.

COURSES IN THE YALE GRADUATE AND PROFESSIONAL SCHOOLS

When a course is open to undergraduate as well as either graduate or professional school students, a Yale College student may enroll under either number, but courses in the graduate and professional schools are not available on the Yale College Credit/D/Fail option; see section B, Grades, "Credit/D/Fail Option."

A student may request to elect a graduate or professional school course, other than those designated independent study, by entering the course on the Course Schedule Selection Form. Students who wish to elect a professional school course must also complete an additional form downloaded from the University Registrar's Office website. This latter form must be completed by the student, signed by the course instructor, and attached to a copy of the syllabus, and must also be signed by the appropriate agent of the dean or the registrar of the school in which the course is offered.

Requests should be made as early as possible in the term in which enrollment is sought and not later than three weeks after the first day of Yale College classes of the term. In recognition of the need to have a student's schedule of courses finalized promptly, forms that are submitted after this date or that are incomplete will normally not be approved. Exceptions require action of the Committee on Honors and Academic Standing, in response to a petition from the student, and will be subject to a fine of at least \$50, with increases of \$5 daily according to lateness.

Note that systems for the award of course credit in the professional schools differ and that not all courses in these schools yield a full course credit in Yale College. Once all materials for a request to elect a professional school course are received by the Office of the University Registrar, a review will be made and the student will be informed as to whether the course will earn Yale College course credit and, if so, how much. Courses that earn no Yale College credit will normally not be entered on the Yale College transcript.

Note also that Yale College students are not permitted to enroll in independent study courses in the Graduate School of Arts and Sciences or in any of the professional schools of the University, unless already accepted into the program for the simultaneous award of the bachelor's and master's degrees.

A student may offer toward the 36-course-credit requirement for the bachelor's degree as many as four course credits earned in professional schools of the University. Courses taken in the Graduate School of Arts and Sciences are not included in this four-credit restriction.

Courses in performance in the School of Music may be taken only after completion of MUSI 363, Performance: Fourth Term, or MUSI 463, Advanced Performance: Fourth Term, in the Department of Music. Performance courses in the School of Music may not be counted toward the 36-course-credit requirement for the bachelor's degree. Such courses will be included on the student's transcript, but must be offered in excess of the thirty-six credits required for graduation. For further information, see under Music. Nonperformance courses in the School of Music may be taken for credit without previous completion of MUSI 363 or 463; such courses are also included in the limit of four credits that may be earned in professional schools of the University.

The deadlines and regulations of Yale College are binding on all students, including candidates for the simultaneous award of the bachelor's and master's degrees, in regard to courses in which they are enrolled in the Graduate School of Arts and Sciences and the professional schools of the University. These include the deadlines and regulations pertaining to withdrawal from courses, late or postponed work, and work incomplete at the end of term. An exception in deadline may be made in a course offered in a

professional school of the University in which the academic calendar differs from that of Yale College. A request for such an exception must be grounded in compelling academic reasons, and must be made in writing by the instructor of the course to the student's residential college dean in advance of the deadline in question. Instructors of courses in the Graduate School and in the professional schools of the University are expected to use the Yale College grading system when they report grades for undergraduates who have completed their courses.

SIMULTANEOUS AWARD OF THE BACHELOR'S AND MASTER'S DEGREES

Students of distinguished ability in a limited number of departments may undertake graduate work that will qualify them for the simultaneous award of the bachelor's and master's degrees at the end of their senior year. The simultaneous degree can be conferred only in a single department or program and only in departments or programs that confer both degrees. For example, a student may not complete a bachelor's degree in Economics and a master's degree in Political Science, nor may a student combine a bachelor's degree in a multi-departmental major (e.g., Ethics, Politics, and Economics) with a master's degree in one of its constituent departments. A student pursuing a simultaneous degree may, however, complete two separate undergraduate majors as long as one of the undergraduate majors is in the same department as the master's degree. Currently, the following departments offer the simultaneous degree option: American Studies; Chemistry; Classics; Computer Science; East Asian Studies; Geology and Geophysics; History; Italian; Linguistics; Mathematics; Molecular Biophysics and Biochemistry; Molecular, Cellular, and Developmental Biology; Music; Political Science; and Statistics and Data Science. For more information about this program, contact the Director of Academic and Educational Affairs, Joel Silverman (joel.silverman@yale.edu).

1. **Eligibility** Applicants cannot be considered for admission unless by the end of their fifth term of enrollment they have achieved at least two-thirds A or A- grades in all of their course credits, as well as in all of the course credits directly relating to their major. Some participating departments have additional eligibility requirements, and students should consult the relevant director of undergraduate studies for this information. Because the Eli Whitney Students program is for enrollment for the degree of Bachelor of Arts (B.A.) or Bachelor of Science (B.S.) only, students in that program are ineligible for the simultaneous award of the bachelor's and master's degrees.

Prior to admission to the program, students enrolling in a course that carries both an undergraduate and a graduate number must do so under the undergraduate number. Students planning to apply to the program who enroll in such a course may request the permission of the instructor to complete the graduate-level requirements of the course and petition to have it converted to the graduate number on the academic record if they are subsequently admitted to the program. The petition, which is made to the director of the program, must be accompanied by certification that the course instructor has approved the student's proposal to complete the course at its graduate level.

2. **Application** Students must apply to their department for admission to the program through their director of undergraduate studies no later than the last day of classes

in their fifth term of enrollment in Yale College. The proposal should provide evidence of eligibility, reasons for pursuing the simultaneous degree, and plans for completing the program requirements. If the department acts favorably on the student's application, it is forwarded with the formal approval of the director of undergraduate studies and of the director of graduate studies to the Director of Academic and Educational Affairs (joel.silverman@yale.edu) in the Yale College Dean's Office, where a joint committee of Yale College and the Graduate School acts upon the department's nomination and notifies the student of acceptance into the program.

3. **Program requirements** Specific requirements for the award of degrees will be determined by each department. Normally a student is expected to complete the requirements of the undergraduate major in addition to eight or more courses in the Graduate School. For all students in the program, graduate work must not be entirely concentrated in the final two terms, and students in the program must take at least six term courses outside the department during their last four terms at Yale and at least two undergraduate courses during their last two terms.

Students may not enroll in Yale College for more than eight terms in order to qualify for the simultaneous award of both degrees. It is possible to earn both degrees in fewer than eight terms, but not by the use of acceleration credits.

Upon acceptance into the program, a student who has accelerated by the use of acceleration credits will automatically be decelerated, and may not, so long as the student remains in the simultaneous degree program, subsequently employ the credits to accelerate.

4. **Requirements for the master's degree** To qualify for the master's degree, students must complete eight term course credits in the Graduate School with grades of A in at least two term courses (or in one year course) and with a B average in the remaining ones. Students in those departments with a language requirement for the Ph.D. degree will be required to demonstrate proficiency in one of the specified languages.
5. **Approval of course schedules** Following notification that they have been accepted into the Program for the Simultaneous Award of the Bachelor's and Master's Degrees, students must have their course schedules approved each term both by the director of undergraduate studies and by the director of graduate studies.
6. **Independent Study** Students who have been admitted into the program may enroll in independent study courses in the graduate or professional school if the Director of Graduate Studies verifies that such courses are applicable to the degree requirements for the master's degree.

COMBINED BACHELOR'S AND MASTER'S DEGREE PROGRAMS IN THE PROFESSIONAL SCHOOLS

Well-qualified students may be able to structure their undergraduate programs so as to become eligible for a master's degree in Public Health, Forestry & Environmental Studies, or Music after one additional year of graduate study at Yale. For more information see the respective program descriptions in Subjects of Instruction.

COURSES IN YALE SUMMER SESSION

There is no limit on the number of on-campus courses in the Yale Summer Session that a Yale College student may offer toward the requirements for the bachelor's degree; however, only four online courses may be applied towards a Yale degree. A maximum of two online courses may be taken per summer by Yale College students. Furthermore, any Yale Summer Session courses selected as Credit/D/Fail will count towards the four-course-credit limit on Credit/D/Fail courses for the bachelor's degree.

Attendance at Yale Summer Session does not constitute a term of enrollment in Yale College. Thus a student accelerating by one term by use of acceleration credits may not offer attendance at Yale Summer Session as one of the required seven terms of enrollment in Yale College.

A student accelerating by the early accumulation of thirty-six course credits all earned at Yale may count credits earned for a grade in Yale Summer Session toward such acceleration. Work completed under the Credit/D/Fail option cannot yield acceleration credit. See section Q, Acceleration Policies, "Acceleration by the Early Accumulation of Thirty-Six Course Credits All Earned at Yale."

Courses successfully completed in Yale Summer Session may be counted toward the requirements of the student's major program. Courses taken for a grade may also be counted toward fulfilling distributional requirements. Courses taken on a Credit/D/Fail basis may not be counted toward fulfilling distributional requirements for the junior year nor toward satisfaction of the distributional requirements for the bachelor's degree. There are no auditing privileges in Yale Summer Session.

All courses completed in Yale Summer Session will be entered on the Yale College record and those taken for a grade will be included in the calculation of the student's eligibility for General Honors and Distinction in the Major. Marks of CR are included in the calculations for some prizes, for Distinction in the Major, and for election to Phi Beta Kappa as non-A grades, but marks of CR are not included in the calculation for General Honors. For further information about Summer Session courses and transcripts, refer to the Yale Summer Session website.

YALE IN LONDON SUMMER PROGRAM

Courses in the summer program at the Paul Mellon Centre for Studies in British Art in London carry full Yale course credit, but enrollment in the Yale in London summer program does not constitute a term of enrollment in Yale College. (Attendance at the Yale College program at the Paul Mellon Centre in London during a spring term does count as a regular term of enrollment.) Thus a student accelerating by one term by use of acceleration credits may not offer attendance at the summer program at the Paul Mellon Centre in London as one of the required seven terms of enrollment in Yale College.

A student accelerating by the early accumulation of thirty-six course credits all earned at Yale may count credits earned in the summer program at the Paul Mellon Centre in London toward such acceleration. See section Q, Acceleration Policies, "Acceleration by the Early Accumulation of Thirty-Six Course Credits All Earned at Yale."

FIELDS & DIRECTED INDEPENDENT LANGUAGE STUDY

Through the Center for Language Study, students may apply to two special language programs: (1) Directed Independent Language Study (DILS), to study a language not taught in a department at Yale; and (2) the Fields program, for discipline-specific language study at advanced levels. For both programs, the selection process is competitive; students submit an application to the committee, which considers the strength of the applicant's academic or professional reasons for their proposed course of study. Students are expected to be self-motivated and to spend significant time on their DILS or Fields study. During the program, students meet with an educated native speaker—a language partner—for two hours per week of conversation, while also studying the language on their own. In consultation with their language partner and the program manager, students devise their own plan of study and locate study materials, including conventional textbooks and web-based language materials. Students are tested at the end of their program using a nationally recognized oral proficiency examination. In Fields, students are also tested at entrance to confirm advanced proficiency. Both programs are open to undergraduates, graduate students, and professional school students. Language study through DILS and Fields is not eligible for course credit, does not satisfy the Yale College language requirement, does not appear on transcripts, and cannot be applied towards the Advanced Language Certificate. Interested students should apply at cls.yale.edu/dils and cls.yale.edu/fields.

AUDITING

Auditors are not permitted in courses taught in Yale College except for persons in one of the categories described below.

Category 1. Students enrolled full time in Yale College or in one of the graduate or professional schools of the University. In this case, the permission of the instructor is the only requirement.

Category 2. Current members of the Yale faculty and emeritus faculty. In this case, the permission of the instructor is the only requirement.

Category 3. Spouses of full-time Yale faculty members, or of emeritus faculty, or of students enrolled full time in the University. In these cases, the permission of both the instructor and the Director of Academic and Educational Affairs (joel.silverman@yale.edu) is required.

Category 4. Employees of the University and their spouses, in accordance with applicable personnel policies. In these cases, the permission of the instructor, the employee's supervisor, and the Director of Academic and Educational Affairs (joel.silverman@yale.edu) is required.

Category 5. Spouses of postdoctoral associates and fellows. In these cases, permission of both the instructor and the Director of Academic and Educational Affairs (joel.silverman@yale.edu) is required.

Those in Categories 1 and 2 should contact the instructor of the course directly; those in Categories 3, 4, and 5 must complete an auditing form, available at the Yale Affiliate Auditing Program website.

No other persons are permitted to audit courses in Yale College, except for alumni eligible for the Alumni Auditing program. The Alumni Auditing program is administered separately from the general auditing program, and different rules may apply. Information is available at the Yale Alumni Auditing Program website.

Persons auditing courses with limited laboratory or computer facilities must secure the explicit permission of the instructor to do so, and should understand that regularly enrolled students must at all times have priority in using such facilities. Computer or language laboratory facilities should be employed by auditors only during times when they are not in heavy demand, and in certain courses charges for computer use may be necessary. General access to the campus computing network may not be available to auditors.

It is the usual expectation that an auditor does not take tests or examinations or write papers for a course for evaluation by the instructor. Occasionally, however, an auditor may wish to do such work and may request the instructor to evaluate it. If the instructor wishes to cooperate with the auditor in this way, the instructor does so on a voluntary basis and not as an obligation.

The University Registrar's Office does not keep a record of courses audited. It is not possible, therefore, for a student's transcript to show that a course has been audited, or for a transcript to be issued that records the auditing of a course.

Persons interested in auditing a course should contact the Yale College Dean's Office, 1 Prospect Street, Academic Affairs suite (lower level).

L. Transfer Students

The following regulations apply to students admitted to Yale College by transfer from other colleges and universities:

1. **Degree requirements** In order to graduate from Yale College, transfer students must fulfill all the requirements for the bachelor's degree. They must thus earn a total of the equivalent of at least thirty-six course credits, that total consisting of the number of credits awarded for their work at their previous institutions combined with the number of course credits subsequently earned at Yale. They must also complete the requirements of a major program in Yale College and fulfill the distributional requirements for the bachelor's degree. Once accepted for admission, transfer students should consult with the director of the transfer program in order to ascertain their status with regard to the distributional requirements, especially the foreign language requirement.
2. **Terms of enrollment at Yale** Transfer students are expected to enroll in Yale College for the number of terms designated at the time of the final credit evaluation made of their work at previous institutions. Under no circumstances may a transfer student complete fewer than four terms of enrollment in Yale College or earn fewer than eighteen course credits at Yale. Transfer students are not eligible for the award of acceleration credit or for acceleration by use of acceleration credits.
3. **Transfer of credits** A preliminary evaluation of transferable credits is made at the time of the student's admission. Final determination of transfer credits is

completed when all official transcripts from a student's previous institutions have been received.

4. **Additional terms at Yale** Students who must remain at Yale beyond the terms designated in the final determination of transfer credits must petition the Committee on Honors and Academic Standing for permission to do so. Such a petition will be considered only if it is impossible for the student to complete the requirements for the bachelor's degree in the designated number of terms. See section A, Requirements for the B.A. or B.S. Degree, "Eight Terms of Enrollment." A student thus granted permission to remain at Yale for an additional term, if the term represents more than the equivalent of eight terms of enrollment at the college level, is not eligible for scholarship assistance from Yale for the additional term, although other forms of financial aid may be available.
5. **Transcripts** A transfer student's Yale transcript indicates the institutions from which the student transferred to Yale and the number of course credits earned there. It does not list the titles of courses taken or grades earned at the transfer student's previous colleges or universities. A transfer student who needs a record of studies completed before admission to Yale must secure a transcript from the previous institutions.
6. **Course credit from outside Yale** Transfer students may receive up to two course credits for work completed outside Yale after matriculation and may receive credit for a Year or Term Abroad according to the guidelines of section P, Credit from Other Universities, and Section K, Special Arrangements, "Year or Term Abroad," provided that they enroll in Yale College for at least four terms, earning by attendance at Yale a minimum of eighteen course credits.
7. **Distributional requirements** Transfer students are not bound by the distributional requirements for the first year, sophomore year, or junior year, but they must fulfill the distributional requirements for the bachelor's degree. See paragraph 1 above.
8. **Attendance at Yale before enrollment** Once a student has been accepted for admission as a transfer student, the student may not attend Yale as an Eli Whitney student or a non-degree student before his or her first term of enrollment at Yale.

M. Eli Whitney Students Program

The Eli Whitney Students program is designed to meet the needs of students who may not be able to attend college full time by allowing nonresident students to enroll in Yale College. The Eli Whitney Students program is for enrollment for the degree of Bachelor of Arts (B.A.) or Bachelor of Science (B.S.) only; students in the program are therefore ineligible for the simultaneous award of the bachelor's and master's degrees.

1. **Academic requirements** The Eli Whitney Students program normally is to be completed in a period not exceeding seven years from initial enrollment. In any calendar year, an Eli Whitney student must have completed three courses to remain in academic good standing. Eli Whitney students are required to meet all of the academic obligations of any course in which they enroll and all requirements of their degree program.
2. **Degree requirements** To qualify for the bachelor's degree through the Eli Whitney Students program, Eli Whitney students must fulfill all the requirements for the bachelor's degree. They must thus earn a total of the equivalent of at least thirty-

six course credits. Eli Whitney students must enroll in Yale College for at least four terms, earning by attendance in the Eli Whitney Students program at least eighteen of the required thirty-six credits. As many as eighteen course credits earned at another college or university or in the Non-degree Students program at Yale may be transferred toward the requirements for the bachelor's degree. Such transfer credit will be awarded for academic courses that were taken at an accredited institution and that were similar in content to Yale courses. Grades of A or B are expected, and no more than one-quarter of courses accepted for transfer toward the requirements for the degree may have grades of C. Eli Whitney students must fulfill the distributional requirements for the bachelor's degree and complete the requirements of a major program in Yale College. See Majors in Yale College and The Undergraduate Curriculum under Major Programs. Once accepted for admission, Eli Whitney students should consult with the director of the Eli Whitney Students program in order to ascertain their status with regard to the distributional requirements, especially the foreign language requirement.

3. **Registration and enrollment** Eli Whitney students submit their course schedules for approval to their residential college dean according to the submission deadline for seniors. Students are permitted to enroll for a full course load, up to 5.5 course credits each term, with the possibility of a greater term load if appropriate permissions are secured. See section C, Course Credits and Course Loads, "Normal Program of Study." Eli Whitney students are not eligible to enroll in Directed Studies or first-year seminars, even during their first year in the program.
4. **Tuition and financial aid** Tuition for the 2019–2020 academic year for Eli Whitney students is \$6,130 per course credit; students are eligible to apply for financial aid. Yale employees are entitled to a tuition reduction as determined by the Office of Human Resources. Tuition must be paid in full to the Office of Student Financial Services before registration.
5. **Facilities and services** Eli Whitney students are entitled to use the library system together with the other facilities that are required for the courses in which they are enrolled, such as laboratories, computers, and the like. They are also eligible for services such as career counseling through the Office of Career Strategy and for fellowships through the Center for International and Professional Experience. Eli Whitney students are entitled to purchase gymnasium memberships and Yale Health coverage. Students in the Eli Whitney program are not eligible for undergraduate housing and they may not serve as first-year counselors.
6. **Regulations** Eli Whitney students are governed by the academic regulations of Yale College, wherever appropriate, and by the rules contained in the Yale online publication *Undergraduate Regulations*. In disciplinary matters, Eli Whitney students are subject to the jurisdiction of the Yale College Executive Committee.
7. **Leave of absence and withdrawal** See section J, Leave of Absence, Withdrawal, and Reinstatement. All regular deadlines and policies apply.
8. **Course credit from outside Yale** Students enrolled in the Eli Whitney Students program may receive up to two course credits for work completed outside Yale after matriculation, according to the guidelines of section P, Credit from Other Universities, provided that they enroll in Yale College for at least four terms, earning by attendance at Yale a minimum of eighteen course credits.

9. **Year or Term Abroad** With the approval of the director of the Eli Whitney Students Program and the Committee on the Year or Term Abroad, students enrolled in the Eli Whitney Students program may undertake study outside the United States for a Year or Term Abroad. An Eli Whitney student must comply with all deadlines and requirements of the Committee on the Year or Term Abroad. See section K, Special Arrangements, "Year or Term Abroad." To be eligible to apply, an Eli Whitney student must have accumulated, before enrolling abroad, at least twelve course credits but no more than twenty-two course credits toward the 36-course-credit requirement. Study abroad must involve full-time work at the university level. Eli Whitney students must enroll for at least two terms in Yale College after their return from study abroad.
10. **Yale students** No person who was ever a regular student in Yale College may enter the Eli Whitney Students program before the lapse of five years after withdrawing from Yale College. A person who in the past has withdrawn from Yale College without graduating and who wishes to return to Yale as a candidate for the bachelor's degree as an Eli Whitney student must make application to the Eli Whitney Students program and fulfill all of its requirements for the bachelor's degree, including the requirement that at least eighteen course credits must be earned while the student is enrolled in the Eli Whitney Students program. Once a former Yale College student has entered the Eli Whitney Students program, that student may pursue the bachelor's degree only through the Eli Whitney Students program.

Further information and application forms for the Eli Whitney Students program are available from the Undergraduate Admissions Office's Eli Whitney Students Program website.

N. Non-degree Students Program

The Non-degree Students program is designed to meet the needs of students with specific and defined educational goals, which may include personal or professional enrichment, exploration of new fields, or preparation for career changes. Normally, students are admitted for a period of one to two terms; students wishing to extend their enrollment must reapply through the Admissions Office.

The Non-degree Students program offers nonresident students who are unable to attend college full time the opportunity to enroll in Yale College courses for credit. The Non-degree Students program is open to graduates of Yale College, and is also open to academically qualified persons who have attended other colleges and universities or who have not continued their education beyond high school. Like all Yale College students, students in this program are required to comply with the academic regulations. Students not matriculated at Yale but participating in one of Yale's Reserve Officers Training Corps (ROTC) programs under a cross-town arrangement are registered as non-degree students. As such, they are subject to Yale College undergraduate regulations as a condition of their participation in Yale's ROTC program.

Non-degree students may enroll in from one to five courses in any academic term. Non-degree students may not take more than a total of eighteen course credits in the Non-degree Students program.

- 1. Academic requirements** Non-degree students are required to meet all of the academic obligations of any course in which they enroll. At the end of a term, the record of any non-degree student who does not have at least a C average for that term will be reviewed and that student may not be permitted to enroll in a subsequent term. To remain in academic good standing, a student is furthermore expected to complete at least one course per term. Withdrawal from all courses in any given term may jeopardize good standing and enrollment in a subsequent term. Students who plan not to enroll in courses in any given term must apply for a leave of absence on or before the fifteenth day of the term in question. A leave of absence may be granted for no more than two terms. Any student who does not enroll in courses in a term and does not apply for a leave of absence may be removed from the program.
- 2. Enrollment and registration** Non-degree enrollment may begin in either the fall or the spring term. All non-degree students register for courses with the Director of Academic and Educational Affairs, 1 Prospect Street, Academic Affairs suite (lower level). In general, admission to limited-enrollment courses is not available to non-degree students. Auditing is not permitted in the Non-degree Students program. Non-degree students are not eligible for enrollment in individual tutorial courses; nor are they eligible, while in the Non-degree Students program, for enrollment in courses in the graduate or the professional schools. Those interested in enrolling in such courses should apply directly to the Graduate School of Arts and Sciences or to the particular professional school in whose courses they wish to enroll.
- 3. Credit/D/Fail option** Non-degree students who wish to elect a course under the Credit/D/Fail option must make a compelling case for that election in a petition to the Director of Academic and Educational Affairs at least one week prior to the Credit/D/Fail conversion deadline. Non-degree students may take no more than one course in a term using the Credit/D/Fail option, and must be enrolled in at least one other course worth a minimum of one course credit during the same term. A maximum of two courses may be taken Credit/D/Fail during a student's time in the Non-degree Students program.
- 4. Tuition** The tuition for non-degree students during 2019–2020 is \$6,130 per course credit; Yale employees and their spouses are entitled to a tuition reduction as determined by the Office of Human Resources. Tuition must be paid in full to the Office of Student Financial Services before registration. Yale provides no financial assistance for non-degree students. Students withdrawing from a course may be eligible for a refund of all or a portion of the tuition fees, in accordance with the tuition refund policy: (a) a student who drops a course for any reason on or before the last day of the course selection period will be refunded the tuition fees paid for that course; (b) a student who drops a course for any reason after the course selection period but on or before the day of midterm will be refunded one-half the tuition paid for that course; (c) a student who drops a course after midterm will not be refunded any portion of the tuition. Fees for late submission of course schedules apply as outlined in section E, Registration and Enrollment in Courses. Late tuition payments will be accepted no later than September 11, 2019, for fall

2019, and January 24, 2020, for spring 2020. Any student who has not completed payment in full for courses by these dates will not be permitted to enroll for that term.

5. **Facilities and services** Non-degree students are entitled to use the library system and other facilities that are required for the courses in which they are enrolled, such as laboratories, computers, and the like. For a fee, they are entitled to purchase gymnasium memberships and Yale Health coverage. Non-degree students are not eligible for undergraduate housing and they may not serve as first-year counselors.
6. **Regulations** Non-degree students are governed by the academic regulations of Yale College and by the rules contained in the Yale online publication *Undergraduate Regulations*. In disciplinary matters, non-degree students are subject to the jurisdiction of the Yale College Executive Committee.
7. **Yale students** Students who have withdrawn from Yale College or who did not complete degree requirements within the number of terms of enrollment for which they were admitted may not return to Yale College to complete degree requirements as non-degree students. This rule includes former Yale College students who are currently employees of the University. Students on leave of absence may not be admitted to the Non-degree Students program.
8. **Yale graduates** Graduates of Yale College who have received the bachelor's degree after eight terms of regular enrollment are eligible to apply as non-degree students either on a full-time or on a part-time basis. But Yale College graduates who have taken degrees after fewer than eight terms of regular enrollment are eligible to apply as non-degree students only on a full-time basis until they have completed the equivalent of eight terms of enrollment in Yale College. Thus a student who took a seven-term degree must be a full-time student for the first term in which he or she is a non-degree student, but may be a part-time non-degree student in a subsequent term. For example, a student who has completed degree requirements at the end of a fall term after eight terms of regular enrollment is eligible to apply as a non-degree student either on a full-time basis or on a part-time basis during the subsequent spring term, but a student who has completed degree requirements at the end of a fall term after seven terms of regular enrollment is eligible to apply as a non-degree student during the subsequent spring term only on a full-time basis. Please note that any courses taken by a former Yale College student in the Non-degree Students program will appear on the undergraduate transcript.
9. **Transfer students** Students who have been accepted for admission as transfer students may not attend Yale as non-degree students before their first term of enrollment at Yale.
10. **Yale employees** Yale employees require permission of their supervisors to apply.

Further information and application forms are available at the Non-degree Students Program website.

O. Visiting International Student Program

The Yale Visiting International Student program (Y-VISP) invites selected undergraduate students from Y-VISP partner institutions to pursue full-time study in Yale College during one term or one academic year. Y-VISP students maintain a full course load, live in the residential colleges alongside Yale College students, and are

fully integrated members of Yale College's academic, residential, and extracurricular communities. Y-VISP oversight and governance is managed by the program's director and the Y-VISP Steering Committee. Additional information is available on the Yale Visiting International Student Program website.

P. Credit from Other Universities

A student may not employ course credits earned at another college or university to reduce the expected number of terms of enrollment in Yale College. Under the conditions described below, a student may apply as many as two course credits earned at another college or university toward the 36-course-credit requirement for graduation from Yale College. Before undertaking such outside study, the student should consult the residential college dean about both the institution to be attended and the course to be taken there.

Courses in Yale Summer Session are not considered outside courses, and there is no limit on the number of such courses that a student may offer toward the requirements of the bachelor's degree; see section K, Special Arrangements, "Courses in Yale Summer Session." Similarly, courses taken in the Yale College program at the Paul Mellon Centre in London are Yale courses and do not count as outside credit. Students who wish to receive credit for summer study abroad with outside programs must apply for approval through the Study Abroad office (see paragraph 9, "Non-Yale Summer Abroad," below).

1. **Approval of credit** In order for credit to be given for courses taken elsewhere, all of the following conditions must be met:
 - a. The Director of Academic and Educational Affairs must approve the award of credit at Yale for the course.
 - b. A student who has studied at an American university, or abroad on a program sponsored by an American university, must provide the office of the residential college dean with an official transcript of the work completed. A student who has enrolled in a program that is not sponsored by an American university should supply an official transcript if the sponsoring institution issues transcripts; if it does not, then the student must furnish an official certificate of enrollment, showing if possible the course or courses completed.
 - c. Students seeking outside credit should be prepared to furnish a copy of the course syllabus, as well as essays and examinations written in the course. In some cases, a letter from the instructor of the course may be required, or the student may be asked to pass an examination on the material of the course. Such information may be particularly necessary in the case of study at a foreign university.
 - d. Study undertaken in the United States must be at a four-year accredited institution that grants a bachelor's degree in the arts and sciences. Foreign study must be completed at a university or other approved institution. Credit may be awarded only for work done while a student was officially enrolled at such an institution, and cannot be given for any work completed independently of such formal enrollment.

- e. A grade of A or B is expected; a grade of C is acceptable. Credit cannot be given for a mark of Credit on a Credit/D/Fail option, or for a grade of Pass on a Pass/Fail option, if the student had the choice of taking the course for a letter grade.
 - f. In order for credit to be given for a course completed at another college or university, the course must carry a value of at least three semester credit hours; if the course is taken at an institution on the quarter system, it must carry a value of at least four-and-one-half quarter units.
 - g. In order for credit to be given for a course completed at another college or university, the number of contact hours for the course must equal or exceed the number of contact hours for an equivalent course offered in Yale College during the fall or spring term, and the length of term (from the first to the last day of classes) must be at least four consecutive weeks.
2. **Residential college seminars** Residential college seminars are, by definition, courses that extend beyond the Yale College curriculum. They are not used as comparables for credit for outside courses, whether in Year or Term Abroad or for other considerations for outside credit.
 3. **Work done while in secondary school** Course credit or distributional credit cannot be given for any college or university course taken while the student was still enrolled in secondary school. Work done after graduation from secondary school but before matriculation at Yale may be accepted on recommendation from the appropriate director of undergraduate studies.

As a regular exception to this rule, students who earned credits while still enrolled in secondary school as members of the Non-degree Students program in Yale College or as students in Yale Summer Session may apply such credits toward the requirements of the bachelor's degree.
 4. **Limit of two course credits** Credit cannot be given for more than two course credits earned at another institution. An exception of one additional course credit may be made only by action of the Committee on Honors and Academic Standing upon the student's petition, normally after the final term of enrollment, or in cases where a student is thereby fulfilling the foreign language requirement in a language not offered at Yale (see "The foreign language requirement and courses taken elsewhere," below). In no case may a student bring in more than three outside graduation course credits.
 5. **Distributional requirements** With permission, course credit earned at another college or university may be applied toward the distributional requirements for the bachelor's degree and to those for the sophomore and junior years whether or not it is counted toward the 36-course-credit requirement for graduation; students should consult with the residential college dean to be directed to the appropriate authority for such approval. Credit from outside Yale may not be applied toward the distributional requirements for the first year. Yale also does not award credit toward distributional requirements for courses completed at another college or university before the student graduated from secondary school, nor for online courses completed outside Yale, except in cases where a student is fulfilling the foreign language requirement in a language not offered at Yale (see "Online courses," below).
 6. **The foreign language requirement and courses taken elsewhere** Students who have taken a course in a foreign language at another institution, either in the

United States or through a program abroad, and who wish to offer that course toward fulfillment of the foreign language distributional requirement must secure the approval of the relevant director of undergraduate studies. While the approval process varies across departments, in no case can it be completed until an official transcript of the work has been received and reviewed by the department. Typically, an additional assessment of the student's work will be necessary, especially with respect to the level (e.g., L3 through L5) that has been achieved by the outside study. Such assessment might include a written or oral examination or both, a review of the course syllabus and written assignments, or other methods of evaluation. Some departments maintain a list of programs that have been previously evaluated, in which case the approval process is often simplified. Students are therefore strongly encouraged to consult the relevant department before undertaking language study elsewhere. For languages not offered at Yale, students should seek guidance from the Center for Language Study about the possibility of fulfilling the language requirement in that language through outside credit.

7. **Major requirements** At the discretion of the director of undergraduate studies in a student's major, work done at another institution may be counted as fulfilling a requirement of the student's major program. This may be done whether or not a course is credited toward the 36-course-credit requirement.
8. **Year or Term Abroad** Students receiving credit for study on a Year Abroad are not eligible to apply additional credit from outside Yale toward the 36-course-credit requirement. Students receiving such credit on a Term Abroad may apply up to two course credits from outside Yale toward the 36-course-credit requirement.

By contrast, students receiving credit for study on a Year or Term Abroad may apply such credit toward the distributional requirements for the bachelor's degree or toward a requirement of the student's major program (see paragraphs 5 and 7 above).

Because the maximum number of outside credits allowed is nine, students who have previously transferred one or two outside credits are normally eligible only for one term abroad. Students who wish to take a year abroad, but who are ineligible by virtue of having transferred one or two outside credits may, with the exception noted below†, request that the University Registrar remove such credit from the transcript by petitioning the Committee on Honors and Academic Standing through their dean's office. If that petition is approved, the Registrar will remove the relevant outside course credit, but the course title will remain on the transcript. Accordingly, this course work may also continue to be applied towards major and distributional requirements.

9. **Non-Yale Summer Abroad** Students who wish to receive credit for summer study abroad with non-Yale programs must apply for approval through the Study Abroad office. The deadline to apply for 2020 non-Yale Summer Abroad credit is March 1, 2020. Information about the application process, including a list of eligible non-Yale programs, is available on the Study Abroad website. Students receiving credit for summer study abroad may apply such credit toward the distributional requirements for the bachelor's degree or toward a requirement of the student's major program (see points 5 and 7 above).

10. **Transfer students** Transfer students may receive up to two course credits for work completed outside Yale after matriculation and may receive credit for a Year or Term Abroad according to the guidelines of section L, Transfer Students, and section K, Special Arrangements, “Year or Term Abroad,” provided that they enroll in Yale College for at least four terms, earning by attendance at Yale a minimum of eighteen course credits.
11. **Internships, field studies, and the like** Course credit cannot be given for such programs as internships, field studies, or workshops, unless such programs include as a component a full, regular, academic course of instruction, and are certified by a transcript from an accredited four-year institution granting a bachelor’s degree.
12. **Independent study** Course credit cannot be given for independent study courses taken at another university.
13. **Online courses** Online courses from other universities may be eligible for Yale credit under limited conditions. The course must include regular, synchronous interaction with the instructor, as well as regular feedback. For online courses offered during the summer, such courses may not be comparable to a course offered online through Yale Summer Session. Online courses may not be used by students to repair a deficiency for promotion (see “Makeup of Course Deficiencies for Promotion or Academic Good Standing,” Section I) and may not be applied toward a distribution requirement, with the exception that online courses in a foreign language not offered at Yale may be applied toward the foreign language requirement (see “The foreign language requirement and courses taken elsewhere” above).
14. **Yale transcript** Outside courses may be entered on a student’s Yale transcript only if they are applied to the 36-course-credit requirement, the distributional requirements, or the requirements of a major program. Such courses must be entered on the Yale transcript if they are to be applied toward any of these requirements. Except for transcripts of transfer students – on which see section L, Transfer Students – courses that are applied toward the 36-course-credit requirement are listed by title with indication of the credit units earned, but without grades. Courses that are applied only toward the distributional requirements are listed without grades and with the designation “for distributional credit only.” Courses that are applied only toward the requirements of a major program are listed without grades and with the designation “for credit toward the major only.” Once a course has been entered on a student’s Yale transcript at the student’s request, or as a consequence of reinstatement, the entry may not subsequently be removed at the student’s request.
15. **Acceleration** See section Q, Acceleration Policies.

† Students on promotion hold who employ outside course credits to repair a credit deficiency cannot subsequently have those credits removed from their transcript for any reason and are thus ineligible to take a year abroad.

Q. Acceleration Policies

ACCELERATION BY THE EARLY ACCUMULATION OF THIRTY-SIX COURSE CREDITS ALL EARNED AT YALE

A student may accelerate progress toward graduation by accumulating thirty-six course credits in fewer than eight terms of enrollment. Such a student must earn all thirty-six course credits at Yale and may not offer course credits earned at another institution in order to reduce the number of terms of enrollment at Yale.

1. **Study abroad** Terms spent on a Year or Term Abroad count as if they were terms of enrollment in Yale College, but course credits earned therein may not be applied to acceleration by the early accumulation of thirty-six course credits because all such credits must be earned at Yale. A spring term at the Yale College program at the Paul Mellon Centre in London is, in fact, a term of enrollment in Yale College, and credits earned in that program may be applied to such acceleration. Attendance at Yale Summer Session or the summer program at the Paul Mellon Centre in London does not count as a term of enrollment, but course credits earned in these summer programs may be applied toward acceleration by the early accumulation of thirty-six credits all earned at Yale. See section K, Special Arrangements, "Courses in Yale Summer Session" and "Yale in London Summer Program."
2. **Patterns of attendance** While students employing acceleration credits in order to acquire an accelerated degree are required to attend Yale in certain patterns of attendance (see "Acceleration by Use of Acceleration Credits," paragraph 4, below), no particular pattern of attendance is required from a student accelerating by the early accumulation of thirty-six course credits all earned at Yale.
3. **Six or seven terms of enrollment** Either a six-term degree or a seven-term degree may be acquired by the accumulation of thirty-six course credits earned at Yale; graduation after fewer than six terms of enrollment in Yale College by such an early accumulation of course credits is not permitted.
4. **Notification by the student** A student intending to accelerate through the early accumulation of thirty-six course credits all earned at Yale must notify the Committee on Honors and Academic Standing through the residential college dean of that intention by the day on which the student's course schedule is due in the final term of enrollment. Such notification must include written certification from the student's director of undergraduate studies that the student will have completed all of the requirements of the major program, and from the residential college dean that the student will have fulfilled the distributional requirements at the conclusion of that term. Failure to do so will result in the student being charged a fine of \$100.
5. **Deceleration** A student may subsequently decelerate and take an eight-term degree. A reversion to an eight-term degree will not affect a student's academic good standing or eligibility for eight terms of financial aid.

ACCELERATION BY USE OF ACCELERATION CREDITS

For the definition of acceleration credits and the criteria for their award, see the First-Year Student Handbook website. For the sake of equity and fairness, no exceptions can be made to the regulations governing the use of acceleration credits.

Inquiries about acceleration may be addressed to the residential college dean or to the University Registrar's Office, 246 Church Street, 432-2330.

1. **Eligibility** The following charts list the number of total credits needed to accelerate by one or two terms during a given term of enrollment:

Acceleration by One Term	Minimum Total Credits	Minimum Yale Course Credits	Activated Acceleration Credits
In the third term	12	8	4
In the fourth term	16	12	4
In the fifth term	21	17	4
In the sixth term	26	22	4

Acceleration by Two Terms	Minimum Total Credits	Minimum Yale Course Credits	Activated Acceleration Credits
In the third term	17	8	9
In the fourth term	21	12	9
In the fifth term	26	17	9

2. **Application deadline** Application to accelerate is made by submission of the required form to the office of the residential college dean. The deadline for applying for acceleration is the last day of classes in the respective term of enrollment given in the eligibility charts above. As a special exception, a student accelerating by one or two terms who wishes to complete a term of study abroad as early as during the third term of enrollment would have to petition to accelerate before the third term of enrollment. Such a student should consult with the residential college dean. The absolute and final deadline for applying for acceleration by one term is the last day of classes in the sixth term of enrollment. The absolute and final deadline for applying for acceleration by two terms is the last day of classes in the fifth term of enrollment.

3. **Course credit requirement for graduation** A student accelerating by two terms must earn at least twenty-seven course credits at Yale, and a student accelerating by one term must earn at least thirty-two course credits at Yale. Therefore, with the exception of credit earned through enrollment in the Year or Term Abroad program, a student accelerating by use of acceleration credits may not apply any credit earned at another college or university toward the 36-course-credit requirement for the bachelor's degree.

4. **Enrollment requirements, including required patterns of attendance** A student intending to accelerate by two terms must complete six terms of full-time enrollment in Yale College. Those six terms may be in any pattern of enrollment as long as the student's sixth and final term of enrollment is a spring term.

A student intending to accelerate by one term must complete seven terms of full-time enrollment in Yale College. Those seven terms may be in any pattern of enrollment as long as the student's seventh and final term of enrollment is a spring term.

A student accelerating by two terms may not combine acceleration credits and course credits to graduate in fewer than six terms; six terms of enrollment is the minimum as well as the maximum requirement for acceleration by two terms.

Likewise, a student accelerating by one term may not combine acceleration credits and course credits to graduate in fewer than seven terms; seven terms of enrollment is the minimum as well as the maximum requirement for acceleration by one term.

5. **Deceleration** A student accelerating by two terms or one term may subsequently apply to decelerate by submitting the required form to the office of the residential college dean. A student who is considering whether to decelerate should consult with the residential college dean as soon as possible. A student accelerating by two terms who subsequently decides to accelerate by only one term must meet the requirements for acceleration by one term. A student accelerating by two terms or one term may subsequently decide to decelerate completely and take an eight-term degree. Since by definition an eight-term degree is not an accelerated degree, such a student will lose the use of acceleration credits. A reversion to an eight-term degree will not adversely affect a student's academic good standing or eligibility for eight terms of financial aid.
6. **Reacceleration** A student who has declared an intention to decelerate and to relinquish the use of acceleration credits is permitted to accelerate again through the use of acceleration credits as long as the student meets the eligibility requirements and application deadline for one or two terms of acceleration given in paragraphs 1 and 2 above.

GENERAL RULES RELATING TO THE USE OF ACCELERATION CREDITS

1. **Notification** The chief responsibility for ascertaining eligibility and for meeting the deadline to apply for acceleration rests with the students themselves. However, the University Registrar's Office will make reasonable efforts to inform students, at the beginning of the third term of enrollment, of their eligibility to accelerate by one or two terms.

It is not the responsibility of the University Registrar's Office or Yale College to remind students who have declared an intention to accelerate of the rules on the pattern of attendance stipulated for the use of acceleration credits. Students who are accelerating are themselves responsible for planning to meet these rules, and if a student's pattern of attendance does not conform to them, it will be concluded that the student has decided to relinquish the use of acceleration credits and not to accelerate. Such a student will be automatically decelerated.

2. **Interruption of studies by leave or withdrawal** Terms of enrollment need not be consecutive. A student accelerating by one or two terms has the same privileges of leave of absence or withdrawal that a nonaccelerating student has.
3. **A third term of leave of absence** A student taking an accelerated degree by use of acceleration credits who has had two terms of leave of absence may receive a third term of leave if it is needed to bring the student's pattern of attendance into conformity with the pattern of attendance stipulated for an accelerated degree. See section J, Leave of Absence, Withdrawal, and Reinstatement, "Leave of Absence"; a student who has received long-term loans through Yale or who is receiving financial aid from Yale should particularly note "Leave of Absence," paragraph 8.
4. **Withdrawal** If a student withdraws from a term after the date on which course schedules for that term are due, the uncompleted term counts as a term of enrollment, both in the determination of the student's eligibility to accelerate and in

the calculation of the number of terms in which the student has been in attendance at Yale. As an exception to this rule, if an accelerating student withdraws from Yale College on the recommendation of Yale Health without having successfully completed a term, the student has the option of not counting the uncompleted term as one of the six or seven terms of enrollment.

5. **Enrollment in Yale Summer Session or the Yale in London summer program**

Attendance at Yale Summer Session or the summer program at the Paul Mellon Centre in London does not constitute a term of enrollment. Thus a student accelerating by one term may not offer attendance at Yale Summer Session or the summer program at the Paul Mellon Centre in London as one of the required seven terms of enrollment in Yale College. Course credits earned by attendance at these summer programs, however, may be applied toward the requirements for the bachelor's degree by accelerating students, provided that such students meet the conditions specified for acceleration by one or two terms. See also section K, Special Arrangements, "Courses in Yale Summer Session" and "Yale in London Summer Program."

6. **Course credit from outside Yale** A student accelerating by two terms must earn at least twenty-seven course credits at Yale, and a student accelerating by one term must earn at least thirty-two course credits at Yale. Therefore, an accelerating student may not apply any credit earned at another college or university toward the 36-course-credit requirement for the bachelor's degree. A student, whether accelerating or not, may be permitted to apply course credits earned at another college or university toward the requirements of the student's major program or toward any of the distributional requirements other than those for the first year. See section P, Credit from Other Universities.

Please note that attendance at the Yale College program at the Paul Mellon Centre in London during the spring term counts just as if it were a term of enrollment at Yale College in New Haven. Attendance at the Paul Mellon Centre during the summer, however, does not count as a term of enrollment. See section K, Special Arrangements, "Yale in London Summer Program."

7. **Year or Term Abroad** A Year Abroad counts as two terms and a Term Abroad counts as one term of enrollment in Yale College. Credits earned on a Year or Term Abroad count as the equivalent of Yale course credits.

Note that after a Year or Term Abroad all students must attend two subsequent terms in Yale College; see section K, Special Arrangements, "Year or Term Abroad." In many cases a student must relinquish the use of acceleration credits and decelerate in order to take a Year or Term Abroad. As a special exception, a student accelerating by one or two terms who wishes to complete a term of study abroad as early as during the third term of enrollment would have to petition to accelerate before the third term of enrollment. A student who wishes to accelerate and to take a Year or Term Abroad should consult with the residential college dean and the Center for International and Professional Experience at the earliest opportunity.

An accelerating student who wishes also to complete a Year or Term Abroad must conform to one of the following schemes:

Terms of Acceleration	Total Terms at Yale	Total Terms on YA/TA	Acceleration Credits	Minimum Course Credits Earned at Yale	Maximum Course Credits Earned on YA/TA
1	6	1	4	28	4
1	5	2	4	23	9
2	5	1	9	23	4
2	4	2	9	18	9

8. **Distributional requirements** Acceleration credits may not be employed to meet the distributional requirements for the first, sophomore, or junior years, or the distributional requirements for the bachelor's degree, including the foreign language requirement. With permission, an accelerating student may apply course credit earned at another college or university toward the distributional requirements for the bachelor's degree and to those for the sophomore and junior years; students should consult with the residential college dean to be directed to the appropriate authority for such approval.
9. **Major requirements** With the permission of the director of undergraduate studies, an accelerating student may apply credit earned at another university toward the requirements of the student's major program.
10. **Makeup of course credit deficiency** If an accelerating student's record at the end of a term of enrollment shows a deficiency for promotion, academic good standing, or graduation, the student will be allowed to repair the deficiency without forfeiting the use of acceleration credits only through enrollment in Yale Summer Session if the credit earned is to be applied toward the 36-course-credit requirement for the bachelor's degree. See section D, Promotion and Good Standing.
11. **Enrollment after graduation as a non-degree student** Accelerating students who have qualified for the award of the bachelor's degree are eligible, as are all Yale College graduates, for full-time enrollment in Yale College as non-degree students. Because such students will have graduated, they will not be eligible for financial aid. See section N, Non-degree Students Program.
12. **Transfer students** Students admitted by transfer from other colleges and universities are not eligible for acceleration by the use of acceleration credits.

R. Amendments

The University reserves the right to amend or supplement these regulations at any time upon such notice to students as it deems appropriate.

III. SUBJECTS OF INSTRUCTION

Majors in Yale College

- African American Studies (B.A.)
 African Studies (B.A.)
 American Studies (B.A.)
 Anthropology (B.A.)
 Applied Mathematics (B.A. or B.S.)
 Applied Physics (B.S.)
 Archaeological Studies (B.A.)
 Architecture (B.A.)
 Art (B.A.)
 Astronomy (B.A.)
 Astrophysics (B.S.)
 Biomedical Engineering (B.S.)
 Chemical Engineering (B.S.)
 Chemistry (B.A. or B.S.)
 Classical Civilization (B.A.)
 Classics (B.A.)
 Cognitive Science (B.A. or B.S.)
 Computer Science (B.A. or B.S.)
 Computer Science and Economics (B.S.)
 Computer Science and Mathematics (B.S.)
 Computer Science and Psychology (B.A.)
 Computing and the Arts (B.A.)
 East Asian Languages and Literatures (B.A.)
 East Asian Studies (B.A.)
 Ecology and Evolutionary Biology (B.A. or B.S.)
 Economics (B.A.)
 Economics and Mathematics (B.A.)
 Electrical Engineering (B.S.)
 Electrical Engineering and Computer Science (B.S.)
 Engineering Sciences (Chemical) (B.S.)
 Engineering Sciences (Electrical) (B.A. or B.S.)
 Engineering Sciences (Environmental) (B.A.)
 Engineering Sciences (Mechanical) (B.A. or B.S.)
 English (B.A.)
 Environmental Engineering (B.S.)
 Environmental Studies (B.A. or B.S.)
 Ethics, Politics, and Economics (B.A.)
 Ethnicity, Race, and Migration (B.A.)
 Film and Media Studies (B.A.)
 French (B.A.)
 Geology and Geophysics (B.S.)
 Geology and Natural Resources (B.A.)
 German Studies (B.A.)
 Global Affairs (B.A.)
 Greek, Ancient and Modern (B.A.)
 History (B.A.)
 History of Art (B.A.)
 History of Science, Medicine, and Public Health (B.A.)
 Humanities (B.A.)
 Italian (B.A.)
 Judaic Studies (B.A.)
 Latin American Studies (B.A.)
 Linguistics (B.A.)
 Literature and Comparative Cultures (B.A.)
 Literature, Comparative (B.A.)
 Mathematics (B.A. or B.S.)
 Mathematics and Philosophy (B.A.)
 Mathematics and Physics (B.S.)
 Mechanical Engineering (B.S.)
 Modern Middle East Studies (B.A.)
 Molecular Biophysics and Biochemistry (B.A. or B.S.)
 Molecular, Cellular, and Developmental Biology (B.A. or B.S.)
 Music (B.A.)
 Near Eastern Languages and Civilizations (B.A.)
 Neuroscience (B.A. or B.S.)
 Philosophy (B.A.)
 Physics (B.S.)
 Physics and Geosciences (B.S.)
 Physics and Philosophy (B.A.)
 Political Science (B.A.)
 Portuguese (B.A.)
 Psychology (B.A. or B.S.)

Religious Studies (B.A.)
Russian (B.A.)
Russian and East European Studies (B.A.)
Sociology (B.A.)
South Asian Studies (second major only)
Spanish (B.A.)
Special Divisional Major (B.A. or B.S.)
Statistics and Data Science (B.A. or B.S.)
Theater Studies (B.A.)
Urban Studies (B.A.)
Women's, Gender, and Sexuality Studies
(B.A.)

Accounting

Courses

* **ACCT 270a or b, Foundations of Accounting and Valuation** Rick Antle

Modern accounting practices and their use in distinguishing value creation from value redistribution. Basic determinants of value and the techniques used to assess it; the creation of value through the production and delivery of goods or services; the conversion of that value into cash flows; basic financial statements, balance sheets, income statements, and cash flow statements, and the accounting mechanics with which they are built. Undergraduate enrollment limited to 50. Juniors and seniors only.

Aerospace Studies

Program adviser: Lieutenant Colonel Holly Hermes (holly.hermes@yale.edu), USAF; Rm. 450, 55 Whitney Ave., 432-9431; airforce@yale.edu; afrotc.yalecollege.yale.edu

Aerospace Studies is the academic component of the Yale Air Force Reserve Officer Training Corps (AFROTC) Detachment 009. Typically, students pursue the Aerospace Studies curriculum in tandem with AFROTC program requirements, including military leadership preparation and physical training. After completing all Air Force ROTC requirements and Yale College academic degree requirements, cadets commission as officers into the Air Force upon graduation from Yale College, serving in a variety of military specialties such as aviation, intelligence, logistics, and medicine. The Aerospace Studies program and the AFROTC prepare students to excel as Air Force leaders and to operate effectively in a dynamic military environment.

For additional information about Yale's Air Force Reserve Officers Training Corps program, visit the program website or send questions to Lt Col Holly Hermes. (holly.hermes@yale.edu)

COURSES FOR NONMAJORS

Enrollment in Aerospace Studies courses is not limited to cadets; courses are open to any Yale student.

ACADEMIC REQUIREMENTS OF THE MAJOR

The Aerospace Studies core curriculum introduces topics such as the profession of arms, military history, military communication, national security, and the philosophy of warfare. The Department of Aerospace Studies presents this content in the context of military leadership to prepare students for active duty service. Most Aerospace Studies courses count for enrollment credit only; they do not count toward the thirty-six course credits required for the Yale bachelor's degree.

Students in the AFROTC program must successfully complete eight USAF courses total, typically taking one course per semester, in addition to the requirements of their Yale College major. The Department of Aerospace Studies offers these requisite courses: USAF 101, 102, 200, 201, 301, 302, 401, and 402. When the Department of History offers HIST 221, Military History of the West since 1500, cadets may use it to fulfill the first term of the 200-level AFROTC requirement and also count it toward the bachelor's degree. AFROTC scholarship recipients must also complete either three credits in a foreign language or six credits in any combination of mathematics, physics, chemistry, or engineering. Cadets become involved in the management of their own cadet wing through a mandatory two-hour leadership laboratory each week.

Credit/D/Fail No course taken Credit/D/Fail may be counted toward the program in Aerospace Studies.

FACULTY ASSOCIATED WITH THE PROGRAM OF AEROSPACE STUDIES

Professor Colonel Thomas McCarthy, USAF (*Adjunct*)

Lecturers Captain Estelle Baik, USAF, Lieutenant Colonel Holly Hermes, USAF, Lieutenant Colonel Kristen Snow, USANG

Courses

*** USAF 101a, Heritage and Values of the U.S. Air Force I** Kristen Snow

Introduction to the U.S. Air Force and how it works as a military institution, including an overview of its basic characteristics, missions, and organizations. Students attend one 50-minute lecture and one 110-minute laboratory each week. For enrollment credit only; cannot be applied toward the 36-course-credit requirement for the Yale bachelor's degree. Grades earned in this course do not count toward GPA or eligibility for General Honors.

*** USAF 102b, Heritage and Values of the U.S. Air Force II** Kristen Snow

Introduction to the U.S. Air Force and how it works as a military institution, including an overview of its basic characteristics, missions, and organizations. Students attend one 50-minute lecture and one 110-minute laboratory each week. For enrollment credit only; cannot be applied toward the 36-course-credit requirement for the Yale bachelor's degree. Grades earned in this course do not count toward GPA or eligibility for General Honors.

*** USAF 301a, Leading People and Effective Communication I** Holly Hermes

Advanced study of leadership concepts and ethics, management and communication skills, and Air Force personnel and evaluation systems. Emphasis on the enhancement of leadership skills. Case studies and exercise of leadership and management techniques in a supervised environment. For enrollment credit only; cannot be applied toward the 36-course-credit requirement for the Yale bachelor's degree. Grades earned in this course do not count toward GPA or eligibility for General Honors.

*** USAF 302b, Leading People and effective Communication II** Holly Hermes

Advanced study of leadership concepts and ethics, management and communication skills, and Air Force personnel and evaluation systems. Emphasis on the enhancement of leadership skills. Case studies and exercise of leadership and management techniques in a supervised environment. For enrollment credit only; cannot be applied toward the 36-course-credit requirement for the Yale bachelor's degree. Grades earned in this course do not count toward GPA or eligibility for General Honors.

*** USAF 401a, National Security, Leadership Responsibilities and Commissioning Preparation I** Estelle Baik

Overview of the complex social and political issues facing the military profession. Designed to provide seniors with a foundation for understanding their role as military officers in American society. Prerequisites: USAF 301, 302 and field training. For enrollment credit only; cannot be applied toward the 36-course-credit requirement for the Yale bachelor's degree. Grades earned in this course do not count toward GPA or eligibility for General Honors.

*** USAF 402b, National Security, Leadership Responsibilities and Commissioning Preparation II** Estelle Baik

Overview of the complex social and political issues facing the military profession. Designed to provide seniors with a foundation for understanding their role as military officers in American society. Prerequisites: USAF 301, 302 and field training. For enrollment credit only; cannot be applied toward the 36-course-credit requirement for

the Yale bachelor's degree. Grades earned in this course do not count toward GPA or eligibility for General Honors.

African American Studies

Director of undergraduate studies: Aimee Cox (aimee.cox@yale.edu), Rm. 302, 81 Wall St., 432-7758; afamstudies.yale.edu

The African American Studies major examines, from numerous disciplinary perspectives, questions of race, culture, and modern struggles for equality centering on the experiences of people of African descent in Black Atlantic societies such as the United States, the Caribbean, Latin America, Europe, and Africa, including the global impact of those experiences. Students in the department explore the historical, cultural, political, economic, and social development of Black Atlantic societies. Majors work to become informed thinkers who are intellectually prepared to offer clarity and insight to ongoing academic and public debates centered in questions concerning race and inequality.

African American Studies majors become knowledgeable about the history, primary methodologies, and interdisciplinary breadth of the field. Students learn to critique, articulate, analyze, and interpret universal themes concerning both individuals in society and group interactions as they relate to the work of scholars, scientists, writers, artists, musicians, economists, and entrepreneurs.

REQUIREMENTS OF THE MAJOR

African American Studies can be taken either as a stand-alone major or as one of two majors in consultation with the director of undergraduate studies (DUS). Pertinent regulations can be found under Two Majors in section K of the Academic Regulations.

The major in African American Studies requires twelve term courses, including seven core courses and five electives in an area of concentration. The seven core courses include the African American history sequence AFAM 160 and AFAM 162, which can be taken in either order; one humanities course in African American literature; one course in the social sciences relevant to African American studies; the junior seminar (AFAM 410); the senior colloquium (AFAM 480) and senior essay (AFAM 491).

Area of concentration Students majoring in African American Studies are required to choose an area of concentration comprised of five courses. This cluster of interrelated courses is intended to ground the student's learning experience in one area of investigation. Often students will choose an area of concentration in a traditional discipline such as political science, art history, economics, sociology, American studies, history, or English language and literature. Students can also construct interdisciplinary areas of concentration that span traditional departments and encompass broader theoretical frameworks such as race and ethnicity, cultural studies, black arts, or feminism and gender studies. All majors are encouraged to take upper-level courses as part of their concentration, especially those courses centering on research and methodology.

None of the seven core courses may be counted among the required electives in the area of concentration.

Junior seminar In their junior year students must take the junior seminar, AFAM 410. This course provides majors with theoretical and methodological bases for the work they will do during their research-oriented senior year.

Credit/D/Fail No more than one course taken Credit/D/Fail may be counted toward the major.

SENIOR REQUIREMENT

Senior majors participate in a colloquium in AFAM 480 that gives them an opportunity to exchange ideas with each other and with more advanced scholars. Students in AFAM 480 submit a prospectus, compile a working bibliography, begin or continue research, and write the first twenty pages of the senior essay. After completing the colloquium, each student carries out the remaining research and writing of a senior essay in AFAM 491 under the guidance of a faculty member in the chosen discipline or area of concentration.

Students are strongly encouraged to use the summer between the junior and senior years for research directly related to the senior essay. For example, field or documentary research might be undertaken in urban or rural communities in America and throughout the diaspora. The particular research topic and design are to be worked out in each case with a faculty adviser.

ADVISING

Students considering a program of study in African American Studies should consult the DUS as early as possible. Areas of concentration and schedules for majors must be approved by the director of undergraduate studies.

Graduate work African American Studies offers training of special interest to those considering admission to graduate or professional schools and careers in education, journalism, law, the arts, business management, city planning, international relations, politics, psychology, publishing, public health, or social work. The interdisciplinary structure of the department offers students an opportunity to satisfy the increasingly rigorous expectations of admissions committees and prospective employers.

STUDY ABROAD

A limited number of courses taken during sophomore or junior semesters abroad can be counted toward the major with DUS approval.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 12 term courses (incl sen req)

Specific courses required AFAM 160, 162, 410

Distribution of courses 1 relevant humanities course and 1 relevant social science course, both approved by DUS; 5 courses in area of concentration

Senior requirement Senior colloquium (AFAM 480) and senior essay (AFAM 491)

FACULTY OF THE DEPARTMENT OF AFRICAN AMERICAN STUDIES

Professors Elijah Anderson, David Blight, Daphne Brooks, Hazel Carby (*Emeritus*), Jacqueline Goldsby, Emily Greenwood, Matthew Jacobson, Gerald Jaynes, Kobena Mercer, Claudia Rankine, Robert Stepto (*Emeritus*), Michael Veal

Associate Professors Aimee Cox, Crystal Feimster, Edward Rugemer

Assistant Professors Rizvana Bradley, Carolyn Roberts

Lecturers Aaron Carico, Thomas Allen Harris

Courses

AFAM 146b / ECON 171b / EDST 271b, Urban Inequalities and Educational Inequality Gerald Jaynes

Analysis of contemporary policy problems related to academic under performance in lower income urban schools and the concomitant achievement gaps among various racial and ethnic groups in United States K-12 education. Historical review of opportunity inequalities and policy solutions proposed to ameliorate differences in achievement and job readiness. Students benefit from practical experience and interdisciplinary methods, including a lab component with time spent in a New Haven high school. Prerequisites: Any course offered by Education Studies, or one course in history or any social science, either: Anthropology, Economics, Political Science, Psychology, Sociology. EDST 110 is preferred, although not required. SO

AFAM 160a / AFST 184a / AMST 160a / HIST 184a, The Rise and Fall of Atlantic Slavery Edward Rugemer

The history of peoples of African descent throughout the Americas, from the first African American societies of the sixteenth century through the century-long process of emancipation. HU

AFAM 162b / AMST 162b / HIST 187b, African American History from Emancipation to the Present Staff

An examination of the African American experience since 1861. Meanings of freedom and citizenship are distilled through appraisal of race and class formations, the processes and effects of cultural consumption, and the grand narrative of the civil rights movement. WR, HU

AFAM 170a / HIST 479a / HSHM 241a, Sickness and Health in African American History Carolyn Roberts

A history of American medicine through the African American experience covering the period of slavery through #BlackLivesMatter. Oriented around the complex dynamics of medical abuse and medical resistance, key themes include medicine and slavery; gender and reproduction; medical experimentation and ethics; the rise of racial science; lynching and vigilante violence; segregation and public health; African-descended approaches to health and healing; the rise of the African American medical profession; and black health activism from slavery to #BlackLivesMatter. HU

AFAM 172b / HIST 119b, The Civil War and Reconstruction Era, 1845–1877 David Blight

The causes, course, and consequences of the American Civil War. A search for the multiple meanings of a transformative event, including national, sectional, racial, constitutional, social, gender, intellectual, and individual dimensions. HU

AFAM 180a / LAST 398a / LITR 329a / SPAN 398a, Caribbean Baseball: A Cultural History Roberto González Echevarría

A study of the origins and evolution of baseball in the Caribbean (Cuba, Dominican Republic, Puerto Rico) in the context of the region's political and cultural history and its relationship with the United States. The course begins with a consideration of the nature of games and the development and dissemination of sports by imperial powers since the nineteenth century: soccer, rugby, and tennis by the UK and basketball

and baseball by the U.S. Topics to be considered: nationalism, the role of race, popular culture, the development of the media, the rise of stars and famous teams, the importance of the Negro Leagues, access of Caribbean players to the Major Leagues, the situation in the present. WR, HU

*** AFAM 182b / ENGL 182b / HUMS 456b, James Baldwin's American Scene**

Jacqueline Goldsby

In-depth examination of James Baldwin's canon, tracking his work as an American artist, citizen, and witness to United States society, politics, and culture during the Civil Rights and Black Arts Movements. WR, HU

AFAM 183a / HSAR 375a, Afro-Modernism in the Twentieth Century Kobena Mercer

Introductory survey of African American, Caribbean, and black British artists in the context of modernism and postmodernism. Cross-cultural dynamics in the aesthetics and politics of race and representation. HU

AFAM 184b / AFST 208b / HSAR 208b, African Arts and Expressive Cultures Cecile

Fromont

This course is an introduction to the arts and expressive cultures of a selection of regions from the African continent, and the Americas. Lectures, readings, and discussions explore the relationship between art and leadership, religion, society, and history on the continent and within African diasporic communities in the Americas. Class meetings and assignments make use of the distinguished collection of African objects at the Yale University Art Gallery. HU

AFAM 186b / LAST 214b / PLSC 378b / SOCY 170b, Contesting Injustice Elisabeth

Wood

Exploration of why, when, and how people organize collectively to challenge political, social, and economic injustice. Cross-national comparison of the extent, causes, and consequences of inequality. Analysis of mobilizations for social justice in both U.S. and international settings. Intended primarily for freshmen and sophomores. SO

AFAM 192a / AFST 238a / AMST 238a / ER&M 238a, Introduction to Third World Studies Gary Okihiro

Introduction to the historical and contemporary theories and articulations of Third World studies (comparative ethnic studies) as an academic field and practice. Consideration of subject matters; methodologies and theories; literatures; and practitioners and institutional arrangements. SO

AFAM 198b / CGSC 277b / EDST 177b / EP&E 494b / PHIL 177b, Propaganda, Ideology, and Democracy Jason Stanley

Historical, philosophical, psychological, and linguistic introduction to the issues and challenges that propaganda raises for liberal democracy. How propaganda can work to undermine democracy; ways in which schools and the press are implicated; the use of propaganda by social movements to address democracy's deficiencies; the legitimacy of propaganda in cases of political crisis. HU

AFAM 203a / MUSI 177a, Coltrane and Hendrix Michael Veal

The parallel careers of John Coltrane and Jimi Hendrix in different genres of black music explored through biographical, music-analytical, and sociocontextual approaches. The stylistic evolutions in each musician's work; the music of Coltrane and

Hendrix as embodiments of, and reactions to, the dominant musical and social issues of the 1960s. HU

* **AFAM 206b / ENGL 234b, Literature of the Black South** Sarah Mahurin

Examination of the intersections between African American and Southern literatures, with consideration of the ways in which the American South remains a space that simultaneously represents and repels an African American ethos. HU

* **AFAM 212b / ENGL 221b, African American Literature in the Archives** Melissa Barton

Examination of African American literary texts within their archival context; how texts were planned, composed, revised, and received in their time. Students pair texts with archival materials from Beinecke Library, including manuscripts, correspondence, photographs, and ephemera. Readings include Lorraine Hansberry, Langston Hughes, James Weldon Johnson, August Wilson, and Richard Wright. HU

* **AFAM 213a / HIST 383Ja / HSHM 481a, Medicine and Race in the Slave Trade** Carolyn Roberts

Examination of the interconnected histories of medicine and race in the slave trade. Topics include the medical geography of the slave trade from slave prisons in West Africa to slave ships; slave trade drugs and forced drug consumption; mental and physical illnesses and their treatments; gender and the body; British and West African medicine and medical knowledge in the slave trade; eighteenth-century theories of racial difference and disease; medical violence and medical ethics. HU

* **AFAM 216a / FILM 433a, Family Narratives/Cultural Shifts** Thomas Allen Harris
This course looks at films that are redefining ideas around family and family narratives in relation to larger social movements. We focus on personal films by filmmakers who consider themselves artists, activists, or agents of change but are united in their use of the nonfiction format to speak truth to power. In different ways, these films use media to build community and build family and ultimately, to build family albums and archives that future generations can use to build their own practices. Just as the family album seeks to unite people across time, space, and difference, the films and texts explored in this course are also journeys that culminate in linkages, helping us understand nuances of identity while illuminating personal relationships to larger cultural, social, and historical movements. HU

* **AFAM 220b / FILM 434b, Archive Aesthetics and Community Storytelling** Thomas Allen Harris

This production course explores strategies of archive aesthetics and community storytelling in film and media. It allows students to create projects that draw from archives – including news sources, personal narratives, and found archives – to produce collaborative community storytelling. Conducted as a production workshop, the course explores the use of archives in constructing real and fictive narratives across a variety of disciplines, such as – participants create and develop autobiographies, biographies, or fiction-based projects, tailored to their own work in film/new media around Natalie Goldberg’s concept that “our lives are at once ordinary and mythical.” HU

* **AFAM 227a / AMST 227a / ER&M 349a / HIST 137Ja, From the Voting Rights Act to #blacklivesmatter** Staff

This course explores the period beginning from 1964 through the emergence of the #blacklivesmatter movement in 2013. Key concepts covered in this course include the

Black Panther Party and rise of the Black Power movement; political campaigns of Shirley Chisholm, Jesse Jackson, and Barack Obama. The seminar concludes with an examination of the #blacklivesmatter movement and broader efforts addressing mass incarceration, poverty, and opportunity gaps in education. HU

AFAM 231a or b / ANTH 211a or b / WGSS 219a / WGSS 436b, Sex and Gender in the Black Diaspora Riché Barnes

A critical survey of images, rhetorics, experiences, and practices of gender and sexuality formation of black subjects in Africa, the Caribbean, western Europe, and the United States. Construction of class, nationality, race, color, sexuality, and gender. SO

*** AFAM 253a / MUSI 381a, Jazz in Transition, 1960–1980** Michael Veal

Stylistic currents in jazz that evolved during the 1960s and 1970s as jazz was influenced by various popular, experimental, and world musics. Focus on the work of Miles Davis, John Coltrane, Ornette Coleman, and Sun Ra. HU

*** AFAM 305a, African American Autobiography** Sarah Mahurin

Examination of African American autobiography, from slave narratives to contemporary memoirs, and how the genre approaches the project (and problem) of knowing, through reading, the relationships of fellow humans. Chronological consideration of a range of narratives and their representations of race, of space, of migration, of violence, of self, and of other, as well as the historical circumstances that inform these representations. Prerequisite: one college-level literature course. HU

*** AFAM 313a / THST 319a, Embodying Story** Renee Robinson

The intersection of storytelling and movement as seen through historical case studies, cross-disciplinary inquiry, and studio practice. Drawing on eclectic source materials from different artistic disciplines, ranging from the repertory of Alvin Ailey to journalism, architectural studies, cartoon animation, and creative processes, students develop the critical, creative, and technical skills through which to tell their own stories in movement. No prior dance experience necessary. HU

*** AFAM 353b / HSAR 472b, Black British Art and Culture** Kobena Mercer

Introduction to black British visual artists and cultural theorists, with a focus on those of African, Caribbean, and South Asian descent. Postcolonial perspectives on diaspora identities and cross-cultural aesthetics in art, film, and photography from 1945 to the present. HU

*** AFAM 373a / AMST 355a / ER&M 380a, White America** Aaron Carico

Critical exploration of how the whiteness of the United States and its institutions has been developed and maintained from the nineteenth century into the present. Special attention paid to the intersection of race and class, particularly to the position of poor whites. Examination of the politics and culture of American whiteness, texts include histories, literary essays, fiction, and films. HU

*** AFAM 378a / ANTH 379a, Anthropology of the Young and the Dispossessed** Aimee Cox

This seminar explores how anthropologists have theorized the category of youth and represented those considered to be young people in ethnographies. After the first two weeks of course orientation to the concepts of adolescence, paternalism, socialization, and rehabilitation, students read one ethnographic work a week that allows the class to interrogate these concepts as they appear in the scholarship of both anthropologists and non-anthropologists. Students discern how some of the same

definitions and assumptions used to define “youth” are mapped onto representations of those communities that have historically been dispossessed. HU, SO

* **AFAM 390a / ER&M 419a / SOCY 319a, Ethnography of the African American Community** Elijah Anderson

An ethnographic study of the African American community. Analysis of ethnographic and historical literature, with attention to substantive, conceptual, and methodological issues. Topics include the significance of slavery, the racial ghetto, structural poverty, the middle class, the color line, racial etiquette, and social identity. SO

* **AFAM 399a / AMST 341a / ER&M 407a, Race and Capitalism** Aaron Carico

This interdisciplinary seminar explores, both theoretically and historically, how racial formations are bound to the formations of capitalism. Focus on the American scene, with sustained inquiry on slavery, its commodity logics, and their residues. Consideration of the effects of immigration and globalization. SO

* **AFAM 406b / AMST 405b, Autobiography in America** Robert Stepto

A study of autobiographical writings from Mary Rowlandson's Indian captivity narrative (1682) to the present. Classic forms such as immigrant, education, and cause narratives; prevailing autobiographical strategies involving place, work, and photographs. Authors include Franklin, Douglass, Jacobs, Antin, Kingston, Uchida, Balakian, Rodriguez, and Bechdel. WR, HU

* **AFAM 410b / AMST 310b / WGSS 410b, Interdisciplinary Approaches to African American Studies** Crystal Feimster

An interdisciplinary, thematic approach to the study of race, nation, and ethnicity in the African diaspora. Topics include class, gender, color, and sexuality; the dynamics of reform, Pan-Africanism, neocolonialism, and contemporary black nationalism. Use of a broad range of methodologies. WR, HU, SO

* **AFAM 471a and AFAM 472b, Independent Study: African American Studies** Staff

Independent research under the direction of a member of the department on a special topic in African American studies not covered in other courses. Permission of the director of undergraduate studies and of the instructor directing the research is required. A proposal signed by the instructor must be submitted to the director of undergraduate studies by the end of the second week of classes. The instructor meets with the student regularly, typically for an hour a week, and the student writes a final paper or a series of short essays. May be elected for one or two terms.

* **AFAM 480a, Senior Colloquium: African American Studies** Aimee Cox

A seminar on issues and approaches in African American studies. The colloquium offers students practical help in refining their senior essay topics and developing research strategies. Students discuss assigned readings and share their research experiences and findings. During the term, students are expected to make substantial progress on their senior essays; they are required to submit a prospectus, an annotated bibliography, and a draft of one-quarter of the essay.

* **AFAM 491a or b, The Senior Essay** Staff

Independent research on the senior essay. The senior essay form must be submitted to the director of undergraduate studies by the end of the second week of classes. The senior essay should be completed according to the following schedule: (1) end of the sixth week of classes: a rough draft of the entire essay; (2) end of the last week of classes

(fall term) or three weeks before the end of classes (spring term): two copies of the final version of the essay.

African Studies

Director of undergraduate studies: Daniel Magaziner (daniel.magaziner@yale.edu), 2685 HGS, 432-6110; director of the program in African Languages: Kiarie Wa'Njogu (john.wanjogu@yale.edu), 309B LUCE, 432-0110; www.yale.edu/macmillan/african

The program in African Studies enables students to undertake interdisciplinary study of the arts, history, cultures, politics, and development of Africa. As a foundation, students in the program gain a cross-disciplinary exposure to Africa. In the junior and senior years, students develop analytical ability and focus their studies on research in a particular discipline such as anthropology, art history, history, languages and literatures, political science, or sociology or on topics such as global health, economic development, or human rights.

African Studies provides training of special interest to those considering admission to graduate or professional schools or careers in education, journalism, law, management, medicine, politics, psychology, international relations, creative writing, or social work. The interdisciplinary structure of the program offers students an opportunity to satisfy the increasingly rigorous expectations of admissions committees and prospective employers for a broad liberal arts perspective that complements specialized knowledge of a field.

REQUIREMENTS OF THE MAJOR

The major for the Class of 2020 With approval from the director of undergraduate studies (DUS), the following changes to the requirements of the major may be fulfilled by students who declared their major under previous requirements.

The major for the Class of 2021 and subsequent classes For students majoring in African Studies, the program consists of twelve term courses, including (1) one African Studies course in the humanities and one in the social sciences; (2) two years of an African language (Arabic, Kiswahili, Yorùbá, isiZulu, or others with permission of the DUS), unless waived by examination; (3) one research methods course, AFST 401 or an alternative course that either serves to deepen the concentration or provide methodological tools for the senior essay, selected in consultation with the DUS; (4) a concentration of four term courses, in a discipline such as anthropology, art history, history, languages and literatures, political science, or sociology, or in an interdisciplinary program such as African American Studies; Ethnicity, Race, and Migration; or Women's, Gender, and Sexuality Studies; or in a cross-disciplinary area such as diaspora studies or development studies; and (5) AFST 491, the senior essay. The required courses represent the core of the program and are intended to expose the student both to the interdisciplinary nature of African studies and to the methodologies currently being brought to bear on the study of African cultures and societies.

Language requirement African Studies majors are required to complete two years of college-level study (or the equivalent) of an African language, and they are encouraged to continue beyond this level. For the language requirement to be waived, a student must pass a placement test for admission into an advanced-level course or, for languages not regularly offered at Yale, an equivalent test of speaking, listening, reading, and writing skills administered through the Center for Language Study. Students should begin their language study as early as possible. If the requirement is

waived, students must substitute other African Studies courses for the four required language courses.

With permission of the DUS, students may count courses in an additional language, such as French or Portuguese, toward the major requirements. Students are encouraged to include upper-level courses, especially those centering on research and methodology.

Program in African Languages The language program offers instruction in four major languages from sub-Saharan Africa: Kiswahili (eastern and central Africa), Yorùbá (western Africa), Wolof (western Africa) and isiZulu (southern Africa). African language courses emphasize communicative competence, using multimedia materials that focus on the contemporary African context. Course sequences are designed to enable students to achieve advanced competence in all skill areas by the end of the third year, and students are encouraged to spend a summer or term in Africa during their language study.

Courses in Arabic are offered through the Department of Near Eastern Languages and Civilizations. Noncredit instruction in other African languages is available by application through the Directed Independent Language Study program at the Center for Language Study. Contact the director of the Program in African Languages (john.wanjogu@yale.edu) for information.

SENIOR REQUIREMENT

Students are required to complete a senior essay in AFST 491, working under the guidance of a faculty adviser. With prior approval by the DUS, a combined senior essay may be submitted for those pursuing a double major.

A preliminary statement indicating the topic to be addressed and the name of the faculty adviser must be submitted to the DUS by the end of the second week of the fall term in the senior year.

ADVISING

Students planning to major in African Studies should consult the DUS as early as possible.

Graduate work, M.A. program Students in Yale College are eligible to complete the M.A. in African Studies in one year of graduate work if they begin the program in the third and fourth undergraduate years. Students interested in this option must complete eight graduate courses in the area by the time of the completion of the bachelor's degree. Only two courses may be counted toward both graduate and undergraduate degrees. Successful completion of graduate courses while still an undergraduate does not guarantee admission into the M.A. program.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 12 term courses (incl senior req)

Distribution of courses 1 AFST course in humanities and 1 in social sciences; 2 years of African lang; 4 courses and 1 research methods course in area of concentration

Senior requirement Senior essay (AFST 491)

Substitution permitted If language req is waived, 4 addtl African Studies courses

FACULTY ASSOCIATED WITH THE PROGRAM OF AFRICAN STUDIES

Professors Lea Brilmayer (*Law School*), John Darnell (*Near Eastern Languages & Civilizations*), Owen Fiss (*Law School*), Robert Harms (*History*), Roderick McIntosh (*Anthropology*), Christopher Miller (*African American Studies, French*), Nicoli Nattrass (*Ethics, Politics, & Economics*) (*Visiting*), Catherine Panter-Brick (*Anthropology*), Lamin Sanneh (*History, Divinity School*), Jeremy Seekings (*Global Affairs*) (*Visiting*), Ian Shapiro (*Political Science*), Robert Thompson (*History of Art*), Michael Veal (*Music*), David Watts (*Anthropology*), Elisabeth Wood (*Political Science*)

Associate Professors Robert Bailis (*Forestry & Environmental Studies*), Daniel Magaziner (*History*)

Assistant Professors Katharine Baldwin (*Political Science*), Adria Lawrence (*Political Science*), Louisa Lombard (*Anthropology*), Jonathan Wrytzen (*Sociology*)

Senior Lecturer Cheryl Doss (*Economics*)

Lecturers Lacina Coulibaly (*Theater Studies*), Anne-Marie Foltz (*Public Health*), David Simon (*Political Science*)

Senior Lectors II Sandra Sanneh, Kiarie Wa'Njogu

Senior Lectors Oluseye Adesola, Matuku Ngame

Courses

*** AFST 001b / ARCG 001b / NELC 001b, Egypt and Northeast Africa: A Multidisciplinary Approach** John Darnell

An introduction to Egyptology, examining approximately 10,000 years of Nile Valley cultural records and 3,000 years of Egyptian history. The course presents an overview of the historical and archaeological study of Egypt and her southern neighbor Nubia. Various original written and visual sources are used, including the collections of the Peabody Museum and the Yale Art Gallery, with some material accessible in the classroom. Students gain a basic understanding of the hieroglyphic script and the Ancient Egyptian language, and are able to read some inscriptions in museum visits at the end of the course. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

*** AFST 028b / ENGL 028b / LITR 025b, African Literature in the World** Cajetan Iheka

This seminar introduces students to a subset of African literature that has entered the canon of world literature. Bookended by the writings of Chinua Achebe and Chimamanda Adichie, we explore the marks of regional specificity in these works and how they transcend local geographical markers to become worldly artifacts. Our considerations include why certain texts cross the boundaries of nation and region while others remain confined within territorial bounds. We also examine advantages of the global circulation of African literary works and the pitfalls of a global readership. The class moves from an introductory unit that orients students to African and world literature to focus on close reading of primary texts informed by historical and theoretical nuances. From analyzing works responding to the colonial condition and the articulation of anticolonial sensibilities, to those narrating the African nation at independence and the postcolonial disillusionment that followed, the seminar attends

to the formal and thematic implications of globalization for African literary writing. Authors include Chinua Achebe, Mariama Ba, Ngugi wa Thiong'o, Mbolo Mbue, NoViolet Bulawayo, Taiye Selasie, and Chimamanda Adichie. WR, HU

*** AFST 128a / ARCG 128a / EGYPT 128a / RLST 251a, Magic and Ritual in Ancient Egypt** John Darnell

Introduction to ancient Egyptian magic and rituals with an overview on the use of magic and discussion of the different rituals and festivals attested in Ancient Egypt. HU

*** AFST 135b / PLSC 135b, Media and Conflict** Graeme Wood

The theory and practice of reporting on international conflict and war, and its relation to political discourse in the United States and abroad. Materials include case studies of media coverage of war in Europe, Africa, and the Middle East.

*** AFST 160a / ER&M 426a, What is the Global South? Africa in the World** Vivian Lu

This course explores how history, culture, and power shape our conceptualization of the world and its peoples. By critically examining how social categories – such as culture, religion, race, economy, and ideology – have been mapped onto different parts of the world, the course traces how legacies of colonialism and imperialism in Africa continue to inform contemporary perspectives of economic development, geopolitics, and globalization. Students consider the history of world categorizations through the perspectives of the people who mobilized to transform them, from anti-colonial fighters and postcolonial scholars to the Third World solidarity movement and contemporary African activists and artists. SO

AFST 184a / AFAM 160a / AMST 160a / HIST 184a, The Rise and Fall of Atlantic Slavery Edward Rugemer

The history of peoples of African descent throughout the Americas, from the first African American societies of the sixteenth century through the century-long process of emancipation. HU

AFST 208b / AFAM 184b / HSAR 208b, African Arts and Expressive Cultures Cecile Fromont

This course is an introduction to the arts and expressive cultures of a selection of regions from the African continent, and the Americas. Lectures, readings, and discussions explore the relationship between art and leadership, religion, society, and history on the continent and within African diasporic communities in the Americas. Class meetings and assignments make use of the distinguished collection of African objects at the Yale University Art Gallery. HU

*** AFST 234a / EP&E 234a, Market Liberalism, Socialist Planning, and Ideas of Development** Nicoli Nattrass

Exploration of market liberalism, socialist planning, and contestation over the role of the state in the idea of development. Study of key classical economists; Marxism and Utopian socialism; how collectivisation was applied in the Soviet Union and in the African context; and discussion of the rise of development economics, highlighting the work of W. Arthur Lewis and Amartya Sen. Prerequisite: ECON 110 or 115, or permission of the instructor. SO

AFST 238a / AFAM 192a / AMST 238a / ER&M 238a, Introduction to Third World Studies Gary Okihiro

Introduction to the historical and contemporary theories and articulations of Third World studies (comparative ethnic studies) as an academic field and practice. Consideration of subject matters; methodologies and theories; literatures; and practitioners and institutional arrangements. SO

*** AFST 250a, African Reconciliation Narratives** Meredith Shepard

This course focuses on the literary and visual cultural productions that took shape around national efforts at reconciliation in three African contexts: post-apartheid South Africa, post-genocide Rwanda, and post-civil war Nigeria. These disparate case studies examine the impact on cultural productions of differing judicial and political formations, as well as the role that literature and film have played in shaping reconciliation law and policy. Our primary readings include novels, memoir, theater, and film, in addition to legal documents from reconciliatory justice systems. Our secondary readings include theories of reconciliation from the fields of law, political science, and cultural studies. HU

AFST 272b / ANTH 272b / ARCG 272b, African Prehistory Jessica Thompson and Roderick McIntosh

Survey of archaeological evidence for the original contributions of the African continent to the human condition. The unresolved issues of African prehistory, from the time of the first hominids, through development of food production and metallurgy, to the rise of states and cities. SO

*** AFST 295a / ENGL 295a / LITR 461a, Postcolonial Ecologies** Staff

This seminar examines the intersections of postcolonialism and ecocriticism as well as the tensions between these conceptual nodes, with readings drawn from across the global South. Topics of discussion include colonialism, development, resource extraction, globalization, ecological degradation, nonhuman agency, and indigenous cosmologies. The course is concerned with the narrative strategies affording the illumination of environmental ideas. We begin by engaging with the questions of postcolonial and world literature and return to these throughout the semester as we read the primary texts, drawn from Africa, the Caribbean, and Asia. We consider African ecologies in their complexity from colonial through post-colonial times. In the unit on the Caribbean, we take up the transformations of the landscape from slavery, through colonialism, and the contemporary era. Turning to Asian spaces, the seminar explores changes brought about by modernity and globalization as well as the effects on both humans and nonhumans. Readings include the writings of Zakes Mda, Aminatta Forna, Helon Habila, Derek Walcott, Jamaica Kincaid, Ishimure Michiko, and Amitav Ghosh. WR, HU

*** AFST 306a / GBL 306a, Social Enterprise in Developing Economies II** Robert Hopkins

Summer research developed into a case-study project on a topic related to the use of social enterprise in regional economic development. GBL 305

AFST 333a / HIST 332a, African Encounters with Colonialism Daniel Magaziner

How African societies and peoples encountered, engaged, and endured the colonial and postcolonial world, from the arrival of Kiswahili-speaking traders at the shores of Lake Victoria in the 1840s through the rise and fall of European colonialism and the resulting

forms of neocolonialism. Transformations and continuities in African religious life; gendered sociability; popular culture. HU

AFST 335a or b / ER&M 325a or b / HIST 335a or b, A History of South Africa Daniel Magaziner

An introduction to the history of southern Africa, especially South Africa. Indigenous communities; early colonial contact; the legacies of colonial rule; postcolonial mismanagement; the vagaries of the environment; the mineral revolution; segregationist regimes; persistent inequality and crime since the end of apartheid; the specter of AIDS; postcolonial challenges in Zimbabwe, Angola, and Mozambique. HU

AFST 340b / HIST 340b, Africa in the Era of the Slave Trade Robert Harms

Examination of the tumultuous changes experienced by African societies during the era of the Atlantic slave trade, approximately 1450–1850. Focus on the complex interaction between the internal dynamics of African societies and the impact of outside forces.

HU

AFST 381b / PLSC 381b, Government and Politics in Africa Katharine Baldwin

The establishment and use of political power in selected countries of tropical Africa. The political role of ethnic and class cleavages, military coups, and the relation between politics and economic development. SO

* **AFST 400a / EP&E 499a / PLSC 401a, Democratic Politics and Public Policy in Contemporary Africa** Jeremy Seekings

Examination of how the resurgence of competitive, multi-party elections in Africa has reinvigorated democratic governance and transformed the process of public policy-making. Emphasis on the political landscape of public opinion and voting behavior; elections and political parties; the state and governance; as well as policy-making, with focus on economic and social policies. SO

* **AFST 435a / THST 335a, West African Dance: Traditional to Contemporary** Lacinia Coulibaly

A practical and theoretical study of the traditional dances of Africa, focusing on those of Burkina Faso and their contemporary manifestations. Emphasis on rhythm, kinesthetic form, and gestural expression. The fusion of modern European dance and traditional African dance. Admission by audition during the first class meeting. HU RP

* **AFST 491b, The Senior Essay** Daniel Magaziner

Independent research on the senior essay. By the end of the sixth week of classes, a rough draft of the entire essay should be completed. By the end of the last week of classes (fall term) or three weeks before the end of classes (spring term), two copies of the final essay must be submitted.

Kiswahili Courses

SWAH 110a, Beginning Kiswahili I Kiarie Wa'Njogu

A beginning course with intensive training and practice in speaking, listening, reading, and writing. Initial emphasis is on the spoken language and conversation. L1
1½ Course cr

SWAH 130a, Intermediate Kiswahili I Veronica Waweru

Further development of students' speaking, listening, reading, and writing skills. Prepares students for further work in literary, language, and cultural studies as well as

for a functional use of Kiswahili. Study of structure and vocabulary is based on a variety of texts from traditional and popular culture. Emphasis on command of idiomatic usage and stylistic nuance. After SWAH 120. L3 1½ Course cr

SWAH 150a, Advanced Kiswahili I Kiarie Wa'Njogu

Development of fluency through readings and discussions on contemporary issues in Kiswahili. Introduction to literary criticism in Kiswahili. Materials include Kiswahili oral literature, prose, poetry, and plays, as well as texts drawn from popular and political culture. After SWAH 140. L5

SWAH 170a, Topics in Kiswahili Literature Kiarie Wa'Njogu

Advanced readings and discussion with emphasis on literary and historical texts. Reading assignments include materials on Kiswahili poetry, Kiswahili dialects, and the history of the language. After SWAH 160. L5, HU

Twi Courses

TWI 110a, Beginning Twi I Staff

This course is an introduction to the basic structure of Twi and the culture of the Akan-Twi-speaking people. Students are introduced to basic grammar and communicative skills and develop familiarity with cultural activities, through role play, conversations, dialogues, and songs. Students acquire basic grammar competence and are able to use appropriate expressions for everyday situations with an understanding and appreciation of the culture of the Akan people in Ghana, West Africa. In addition to Asante Twi, students are exposed to Akuapem Twi and Fante. Course taught through distance learning using videoconferencing technology from Columbia University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L1 RP 1½ Course cr

Yorùbá Courses

YORU 110a, Beginning Yorùbá I Oluseye Adesola

Training and practice in speaking, listening, reading, and writing. Initial emphasis is on the spoken aspect, with special attention to unfamiliar consonantal sounds, nasal vowels, and tone, using isolated phrases, set conversational pieces, and simple dialogues. Multimedia materials provide audio practice and cultural information. L1 1½ Course cr

YORU 130a, Intermediate Yorùbá I Oluseye Adesola

Refinement of students' speaking, listening, reading, and writing skills. More natural texts are provided to prepare students for work in literary, language, and cultural studies as well as for a functional use of Yorùbá. After YORU 120. L3 1½ Course cr

YORU 150a, Advanced Yorùbá I Oluseye Adesola

An advanced course intended to improve students' aural and reading comprehension as well as speaking and writing skills. Emphasis on acquiring a command of idiomatic usage and stylistic nuance. Study materials include literary and nonliterary texts; social, political, and popular entertainment media such as movies and recorded poems (*ewi*); and music. After YORU 140. L5

YORU 170a, Topics in Yorùbá Literature and Culture Oluseye Adesola

Advanced readings and discussion concerning Yorùbá literature and culture. Focus on Yorùbá history, poetry, novels, movies, dramas, and oral folklore, especially from

Nigeria. Insight into Yorùbá philosophy and ways of life. Prerequisite: YORU 160. L5, HU

Wolof Courses

* WLOF 110a, Elementary Wolof I Staff

Introduction to the basic sentence structure and other fundamentals of the Wolof language, with attention to the development of speaking, listening, reading, and writing skills. Exercises based on major cultural aspects of traditional and modern Senegalese society. Course taught through distance learning using videoconferencing technology from Columbia University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L1 RP 1½ Course cr

* WLOF 120b, Elementary Wolof II Staff

Continuation of WLOF 110. Further development of proficiency in the language through communicative methods and the use of authentic learning materials. Prerequisite: WLOF 110 or equivalent. Course taught through distance learning using videoconferencing technology from Columbia University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L2 RP 1½ Course cr

* WLOF 130a, Intermediate Wolof I Staff

This course will further your awareness and understanding of the Wolof language and culture, as well as improve your mastery of grammar, writing skills, and oral skills. Course materials will incorporate various types of text including tales, cartoons, as well as multimedia such as films, videos, and audio recordings. Wolof 120, or equivalent L3 RP 1½ Course cr

WLOF 140b, Intermediate Wolof Language II Staff

This course will further your awareness and understanding of the Wolof language and culture, as well as improve your mastery of grammar, writing skills, and oral skills. Course materials will incorporate various types of text including tales, cartoons, as well as multimedia such as films, videos, and audio recordings. Wolof 130, or equivalent. Course taught through distance learning using videoconferencing technology from Columbia University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L4 RP 1½ Course cr

Zulu Courses

ZULU 110a, Beginning isiZulu I Sandra Sanneh

A beginning course in conversational isiZulu, using Web-based materials filmed in South Africa. Emphasis on the sounds of the language, including clicks and tonal variation, and on the words and structures needed for initial social interaction. Brief dialogues concern everyday activities; aspects of contemporary Zulu culture are introduced through readings and documentaries in English. L1 1½ Course cr

ZULU 120b, Beginning isiZulu II Sandra Sanneh

Development of communication skills through dialogues and role play. Texts and songs are drawn from traditional and popular literature. Students research daily life in selected areas of South Africa. Prerequisite: ZULU 110. L2 1½ Course cr

ZULU 130a, Intermediate isiZulu I Sandra Sanneh

Development of fluency in speaking, listening, reading, and writing, using Web-based materials filmed in South Africa. Students describe and narrate spoken and written paragraphs. Review of morphology; concentration on tense and aspect. Materials are drawn from contemporary popular culture, folklore, and mass media. After ZULU 120.

L3 1½ Course cr

*** ZULU 150a, Advanced isiZulu I** Sandra Sanneh

Development of fluency in using idioms, speaking about abstract concepts, and voicing preferences and opinions. Excerpts from oral genres, short stories, and television dramas. Introduction to other South African languages and to issues of standardization, dialect, and language attitude. After ZULU 140. Course includes students from Cornell University via videoconference. L5

American Studies

Director of undergraduate studies: Albert Laguna (albert.laguna@yale.edu), Arnold Hall, A-24, 432-1188; americanstudies.yale.edu

The American Studies program encourages the interdisciplinary study of the cultures and politics of the United States, the changing representations of national identity, and the construction of borderland and diasporic cultures over time. Each student in the major combines courses in American Studies with courses from other relevant disciplines (literature, history, the arts, and the social sciences) to explore these broad topics from local, national, and global perspectives. Through the selection of an area of concentration, each student develops a focus for course work in the major. The program encourages scholarly work in nontraditional combinations of disciplines; at the same time, however, it assumes and requires a substantial foundation of knowledge in the history and culture of the United States. Students interested in the major are encouraged to consult with the director of undergraduate studies (DUS) as early as possible.

REQUIREMENTS OF THE MAJOR

All students majoring in American Studies must take fourteen term courses approved by the program's faculty. Although a good deal of freedom in course selection is permitted, it is expected that all students will acquaint themselves with the materials, skills, and perspectives of cultural studies. Accordingly, the major requires completion – preferably by the end of the sophomore year, but no later than the end of the junior year – of at least four gateway courses (AMST 111–299), including two in cultural history/cultural studies, one broad survey course in American literature, and one course preparatory for work in the student's area of concentration, to be selected in consultation with the DUS. One of these four courses must be listed as an "Early Americas" course on the American Studies website. Students may, with DUS permission, substitute a first-year seminar for a gateway course. An additional five concentration courses from diverse disciplines must be taken for a letter grade, one of which must incorporate a comparable topic from a non-U.S. perspective. Two electives chosen from the American Studies course offerings are also required.

Students must take two junior seminars (AMST 300–399) during their junior year. At least one of the seminars must fall within the student's area of concentration, described below. In each of the seminars, students are expected to demonstrate proficiency in interdisciplinary research and analysis through the production of critical essays on primary source materials or a paper of fifteen to twenty pages. Sophomores contemplating a junior term abroad are urged to take one of the junior seminars in the spring term of their sophomore year.

Areas of concentration Each American Studies major selects an area of concentration, normally in the fall of the junior year, from six possible choices: (1) national formations, (2) the international United States, (3) material cultures and built environments, (4) politics and American communities, (5) visual, audio, literary, and performance cultures, and (6) public humanities. The concentration in national formations explores historic migrations, settlements, and encounters among peoples who have formed the American nation, with an emphasis on Native American history and the construction of America's frontiers and borderlands. The international United

States concentration focuses on historic and contemporary diasporas, the role of the United States outside its national borders, and the flows of American peoples, ideas, and goods throughout the globe. Students in the material cultures and built environments concentration examine the formation of the American landscape from the natural to the human-made, including the development of American architecture and the visual and decorative arts. The concentration in politics and American communities investigates the emergence of social groups and their political struggles at the local and national levels, emphasizing the themes of power, inequality, and social justice. Majors with a concentration in visual, audio, literary, and performance cultures study American consumer culture, popular culture, representations, and media in relation to U.S. literatures. Students in the public humanities concentration explore various forms of public intellectual engagement, including museum studies, documentary work, public history, digital humanities, and archival based work in the visual or performing arts; senior projects in this area may consist of works or productions beyond the traditional scholarly essay. Students may also petition the DUS to develop an independent concentration.

Roadmap See visual roadmap of the requirements.

SENIOR REQUIREMENT

During the senior year, each student in the major completes work in the area of concentration in one of three ways. First, the student may enroll in a senior seminar within the area of concentration (AMST 400–490). Students should apply interdisciplinary methods and undertake original research to produce a final paper of twenty to twenty-five pages. Students must complete all course requirements to fulfill the senior requirement. Students electing this option should submit the senior seminar registration form, signed by the seminar instructor, to the DUS.

Second, the student may complete a one-term senior project or essay (AMST 491). The product should be a thirty-page essay or its equivalent in another medium. To apply for admission to AMST 491, a student should submit a prospectus, signed by the faculty adviser, to the DUS.

Third, the student may enroll in the intensive major (AMST 493 and 494) and work independently for two terms. The intensive major offers an opportunity for significant original research leading to a substantial senior project. AMST 493, 494 carries two terms of credit; its final product should be a sixty-page essay or its equivalent in another medium. All students in the intensive major participate in a yearlong proseminar on theory and methods. One term of the two-term project may count as a course in the area of concentration. To apply for admission to AMST 493 and 494, a student should submit a prospectus, signed by the faculty adviser, to the DUS.

As a multidisciplinary program, American Studies draws on the resources of other departments and programs in the University. The list of American Studies courses is meant to be suggestive only: apart from those courses required for the major, it is neither restrictive nor exhaustive. Students are encouraged to examine the offerings of other departments in both the humanities and the social sciences, as well as residential college seminars, for additional relevant courses. The stated area of concentration of each student determines the relevance and acceptability of other courses.

ADVISING

Combined B.A./M.A. degree program Exceptionally able and well-prepared students may complete a course of study leading to the simultaneous award of the B.A. and M.A. degrees after eight terms of enrollment. See Academic Regulations, section K, Special Arrangements, "Simultaneous Award of the Bachelor's and Master's Degrees." Interested students should consult the DUS prior to the sixth term of enrollment for specific requirements in American Studies.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 14 term courses (incl senior req)

Distribution of courses 4 gateway courses, as specified; 2 junior sems, 1 in area of concentration; 5 courses in area of concentration for letter grades, 1 on a related non-U.S. topic, (1 may be one term of two-term senior project); 2 electives

Substitution permitted 1 first-year sem for 1 gateway course; others with DUS permission

Senior requirement Senior sem (AMST 400–490) or one-term senior project (AMST 491) related to area of concentration

Intensive major Same, except a two-term senior project (AMST 493 and 494) replaces senior sem (AMST 400–490) or AMST 491

FACULTY ASSOCIATED WITH THE PROGRAM OF AMERICAN STUDIES

Professors Ned Blackhawk (*History*), David Blight (*History, African American Studies*), Daphne Brooks (*African American Studies, Theater Studies*), Alicia Schmidt Camacho (*Ethnicity, Race, & Migration*), Hazel Carby (*African American Studies*), Edward Cooke, Jr. (*History of Art*), Michael Denning (*English, Ethnicity, Race, & Migration*), Wai Chee Dimock (*English*), Kathryn Dudley (*Anthropology*), Joanne Freeman (*History*), Beverly Gage (*History*), Jacqueline Goldsby (*English, African American Studies*), Inderpal Grewal (*Women's, Gender, & Sexuality Studies, Anthropology*), Matthew Jacobson (*Chair, African American Studies, History*), Kathryn Lofton (*Religious Studies*), Lisa Lowe, Mary Lui (*History, Head of Timothy Dwight College*), Joanne Meyerowitz (*History*), Charles Musser (*Film & Media Studies*), Tavia Nyong'o (*Theater Studies*), Gary Okihiro (*Theater Studies*), Stephen Pitti (*History, Ethnicity, Race, & Migration, Head of Ezra Stiles College*), Sally Promey (*Divinity School, Religious Studies*), Joanna Radin, (*History of Medicine, Anthropology, History*), Ana Ramos-Zayas (*Ethnicity, Race, & Migration, Women's, Gender & Sexuality Studies*), Marc Robinson (*Theater Studies, English*), Paul Sabin (*History, Environmental Studies*), Caleb Smith (*English*), Robert Stepto (*English, African American Studies*), Harry Stout (*Religious Studies, History*), Michael Veal (*Music, African American Studies*), John Warner (*History of Medicine, History*), Michael Warner (*English*), Laura Wexler (*Women's, Gender, & Sexuality Studies*), Bryan Wolf

Associate Professors Rene Almeling (*Sociology*), Laura Barraclough (*Ethnicity, Race, & Migrations*), Crystal Feimster (*African American Studies*), Zareena Grewal (*Ethnicity, Race, & Migration, Religious Studies*), Daniel HoSang (*Ethnicity, Race, & Migration*), Greta LaFleur (*Women's, Gender, & Sexuality Studies*), Elihu Rubin (*Architecture*), Tisa Wenger (*Divinity School, Religion*)

Assistant Professor Albert Laguna (*Ethnicity, Race, & Migration*)

Senior Lecturer James Berger (*English*)

Lecturers Ryan Brasseaux (*Head of Davenport College*), Karin Roffman (*Humanities, English*), Quan Tran (*Ethnicity, Race, & Migration*)

First-Year Seminars

* **AMST 007a / HSAR 002a, Furniture and American Life** Edward Cooke

In-depth study and interpretation of American furniture from the past four centuries. Hands-on experience with furniture in the collection of the Yale University Art Gallery to explore such topics as materials, techniques, styles, use, and meaning. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU RP

* **AMST 012b / HIST 012b, Politics and Society in the United States after World War II** Jennifer Klein

Introduction to American political and social issues from the 1940s to the present, including political economy, civil rights, class politics, and gender roles. Legacies of the New Deal as they played out after World War II; the origins, agenda, and ramifications of the Cold War; postwar suburbanization and its racial dimensions; migration and immigration; cultural changes; social movements of the Right and Left; Reaganism and its legacies; the United States and the global economy. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

Gateway Courses

AMST 116a / RLST 115a, How to Build an American Religion Kathryn Lofton

How communities can be organized through code, charisma, ritual, and cosmology. Topics include strategies for concretizing utopia and establishing communal principles, expanding audiences, and specifying creed. This course serves as an introduction to religion through theoretical readings and specific examples drawn from the transnational American scene, past and present. Discussion of particular leaders, sects, practices, and media will offer insights into how ideas organize societies and individuals establish themselves as icons. Students adapt strategies taught in the course in order to practice their own capacity to foster social movements, develop and critique brands, and consider the relationship between religion, politics, and economy. HU

AMST 141a / HIST 141a, The American West Travis Ross

The history of the American West as both frontier and region, real and imagined, from the first contacts between Indians and Europeans in the fifteenth century to the multicultural encounters of the contemporary Sunbelt. Students work with historical texts and images from Yale's Western Americana Collection. HU

AMST 160a / AFAM 160a / AFST 184a / HIST 184a, The Rise and Fall of Atlantic Slavery Edward Rugemer

The history of peoples of African descent throughout the Americas, from the first African American societies of the sixteenth century through the century-long process of emancipation. HU

AMST 162b / AFAM 162b / HIST 187b, African American History from Emancipation to the Present Staff

An examination of the African American experience since 1861. Meanings of freedom and citizenship are distilled through appraisal of race and class formations, the

processes and effects of cultural consumption, and the grand narrative of the civil rights movement. WR, HU

AMST 188a / HIST 115a, The Colonial Period of American History Staff

This course explores the history of North America from the period of European colonization through the era of the Seven Years' War, from roughly 1492 to 1763. Emphasis is placed on the migration of people from Europe and Africa to North America; their contact and interaction with Native Americans; the formation of new societies and economies; and the corresponding development of new political and social ideas in America, with special attention paid to the evolving relationship between slavery and freedom. Although the course addresses the major themes and issues of early American history, the lectures and readings frequently focus on the lives of individuals, both prominent and obscure, who shaped and were shaped by larger forces and developments. HU

AMST 197b / ARCH 280b / HSAR 219b, American Architecture and Urbanism Elihu Rubin

Introduction to the study of buildings, architects, architectural styles, and urban landscapes, viewed in their economic, political, social, and cultural contexts, from precolonial times to the present. Topics include: public and private investment in the built environment; the history of housing in America; the organization of architectural practice; race, gender, ethnicity and the right to the city; the social and political nature of city building; and the transnational nature of American architecture. HU

*** AMST 206b / ER&M 221b / WGSS 222b, Introduction to Critical Refugee Studies**
Quan Tran

Reconfiguring refugees as fluid subjects and sites of social, political, and cultural critiques. Departing from dominant understandings of refugees as victims, consideration instead of refugees as complex historical actors, made visible through processes of colonization, imperialism, war, displacement, state violence, and globalization, as well as ethical, social, legal, and political transformations. Focus on second-half of the twentieth century. SO

AMST 209a / ER&M 223a / PLSC 262a, Race, Politics, and the Law Daniel HoSang

Examination of how race—as a mode of domination and resistance—has developed and transformed in the United States since the early-twentieth-century. How political actors and social movements engage the law to shape visions of freedom, democracy, and political life. Consideration of critical race theory, political discourse analysis, intersectionality and women of color feminism, and American political development. SO

*** AMST 227a / AFAM 227a / ER&M 349a / HIST 137Ja, From the Voting Rights Act to #blacklivesmatter** Staff

This course explores the period beginning from 1964 through the emergence of the #blacklivesmatter movement in 2013. Key concepts covered in this course include the Black Panther Party and rise of the Black Power movement; political campaigns of Shirley Chisholm, Jesse Jackson, and Barack Obama. The seminar concludes with an examination of the #blacklivesmatter movement and broader efforts addressing mass incarceration, poverty, and opportunity gaps in education. HU

AMST 236a / EVST 318a / HIST 199a / HSHM 207a, American Energy History Paul Sabin

The history of energy in the United States from early hydropower and coal to present-day hydraulic fracturing, deepwater oil, wind, and solar. Topics include energy transitions and technological change; energy and democracy; environmental justice and public health; corporate power and monopoly control; electricity and popular culture; labor struggles; the global quest for oil; changing national energy policies; the climate crisis. HU

AMST 238a / AFAM 192a / AFST 238a / ER&M 238a, Introduction to Third World Studies Gary Okihiro

Introduction to the historical and contemporary theories and articulations of Third World studies (comparative ethnic studies) as an academic field and practice. Consideration of subject matters; methodologies and theories; literatures; and practitioners and institutional arrangements. SO

* **AMST 257a / ENGL 325a, Modern Apocalyptic Narratives** James Berger

The persistent impulse in Western culture to imagine the end of the world and what might follow. Social and psychological factors that motivate apocalyptic representations. Differences and constant features in apocalyptic representations from the Hebrew Bible to contemporary science fiction. Attitudes toward history, politics, sexuality, social class, and the process of representation in apocalyptic texts. HU

* **AMST 258a / EVST 258a, Wilderness in the North American Imagination** Carlos Nugent

The idea and practice of wilderness in American history, art, literature, society, and politics. Authors include Salomon Northup, Henry David Thoreau, John Muir, Jack London, Aldo Leopold, and Rachel Carson. A class dinner and field trip are held during the term. HU

Junior Seminars

* **AMST 310b / AFAM 410b / WGSS 410b, Interdisciplinary Approaches to African American Studies** Crystal Feimster

An interdisciplinary, thematic approach to the study of race, nation, and ethnicity in the African diaspora. Topics include class, gender, color, and sexuality; the dynamics of reform, Pan-Africanism, neocolonialism, and contemporary black nationalism. Use of a broad range of methodologies. WR, HU, SO

* **AMST 330b / ENGL 236b, Dystopic and Utopian Fictions** James Berger

Attempts since the late nineteenth century to imagine, in literature, cinema, and social theory, a world different from the existing world. The merging of political critique with desire and anxiety; the nature and effects of social power; forms of authority, submission, and resistance. HU

* **AMST 332a / HSAR 410a, Humbugs and Visionaries: American Artists and Writers Before the Civil War** Bryan Wolf

This course examines American literature and visual culture of the seventeenth, eighteenth, and nineteenth centuries. We look in particular at outliers, prophets, and self-promoters, from the radical Puritan writer Anne Bradstreet to popular entertainers like P. T. Barnum. Topics include: visuality and the public sphere; landscape and politics; genre painting and hegemony; race and identity; managerial culture and

disembodied vision. Class trips to the Yale University Art Gallery and the Metropolitan Museum (New York). HU

* **AMST 335a / ER&M 320a, Indigenous Geographies** Laura Barraclough

This seminar examines the spatiality of indigenous communities, both on their own terms and in relationship to ongoing processes of settler colonialism. Focusing primarily on indigenous geographies and place-making practices in the settler United States, it explores the survivance and creativity of Native peoples in the face of persistent spatial violence. While rooted in the intellectual traditions of critical indigenous studies, we also engage scholarship from history, geography, architecture and planning, anthropology, sociology, and education. Topics include: land-based ways of knowing, relations of care, and identity/community formation; treaties, relocation, and reservation-making; ideologies and practices of property; urbanization, urban indigenous communities, and urban activism; cartography and Geographic Information Systems (GIS); movement and mobility; environmental justice hazards and activism; public memory, monuments, and place-names; the significance of borders (both national and local), especially in relationship to violence; and place-based efforts toward co-existence and solidarity in a more-than-human world. No formal prerequisites; prior coursework in Native American history or studies is helpful, but not required. HU, SO

* **AMST 341a / AFAM 399a / ER&M 407a, Race and Capitalism** Aaron Carico

This interdisciplinary seminar explores, both theoretically and historically, how racial formations are bound to the formations of capitalism. Focus on the American scene, with sustained inquiry on slavery, its commodity logics, and their residues. Consideration of the effects of immigration and globalization. SO

* **AMST 345a / ER&M 409a / WGSS 408a, Latinx Ethnography** Ana Ramos-Zayas

Consideration of ethnography within the genealogy and intellectual traditions of Latinx Studies. Topics include: questions of knowledge production and epistemological traditions in Latin America and U.S. Latino communities; conceptions of migration, transnationalism, and space; perspectives on "(il)legality" and criminalization; labor, wealth, and class identities; contextual understandings of gender and sexuality; theorizations of affect and intimate lives; and the politics of race and inequality under white liberalism and conservatism in the United States. SO

* **AMST 346b / ENGL 235b / HUMS 252b, Poetry and Objects** Karin Roffman

This course on 20th and 21st century poetry studies the non-symbolic use of familiar objects in poems. We meet alternating weeks in the Beinecke library archives and the Yale Art Gallery objects study classroom to discover literary, material, and biographical histories of poems and objects. Additionally, there are scheduled readings and discussions with contemporary poets. Assignments include both analytical essays and the creation of online exhibitions. WR, HU

* **AMST 349a or b / THST 427a or b, Technologies of Movement Research** Emily Coates

An interdisciplinary survey of creative and critical methods for researching human movement. Based in the motion capture studio at the Center for Collaborative Arts and Media, the course draws movement exercises and motion capture experiments together with literature from dance and performance studies, art, anthropology, sociology, philosophy, cognitive science, and the history of science to investigate the ways that

artists and scholars conceive of human movement as a way of knowing the world. Students will develop their own projects over the course of the semester. No prior experience in dance required.

* **AMST 355a / AFAM 373a / ER&M 380a, White America** Aaron Carico

Critical exploration of how the whiteness of the United States and its institutions has been developed and maintained from the nineteenth century into the present. Special attention paid to the intersection of race and class, particularly to the position of poor whites. Examination of the politics and culture of American whiteness, texts include histories, literary essays, fiction, and films. HU

* **AMST 358b / ENGL 281b, Animals in Modern American Fiction** James Berger

Literary portrayals of animals are used to examine the relations between literature, science, and social and political thought since the late nineteenth century. Topics include Darwinist thought, socialism, fascism, gender and race relations, new thinking about ecology, and issues in neuroscience. HU RP

* **AMST 370b / THST 380b, The History of Dance** Brian Seibert

An examination of major movements in the history of concert and social dance from the late nineteenth century to the present, including ballet, tap, jazz, modern, musical theater, and different cultural forms. Topics include tradition versus innovation, the influence of the African diaspora, and interculturalism. Exercises are used to illuminate analysis of the body in motion. WR, HU

Senior Seminars

* **AMST 403a, Introduction to Public Humanities** Ryan Brasseaux

Introduction to the various media, topics, debates, and issues framing public humanities. The relationship between knowledge produced in the university and the circulation of ideas among a broader public, including modes of inquiry, interpretation, and presentation. Public history, museum studies, oral and community history, public art, documentary film and photography, public writing and educational outreach, and the socially conscious performing arts. HU

* **AMST 405b / AFAM 406b, Autobiography in America** Robert Stepto

A study of autobiographical writings from Mary Rowlandson's Indian captivity narrative (1682) to the present. Classic forms such as immigrant, education, and cause narratives; prevailing autobiographical strategies involving place, work, and photographs. Authors include Franklin, Douglass, Jacobs, Antin, Kingston, Uchida, Balakian, Rodriguez, and Bechdel. WR, HU

* **AMST 406a / ENGL 326a, The Spectacle of Disability** James Berger

Examination of how people with disabilities are represented in U.S. literature and culture. Ways in which these representations, along with the material realities of disabled people, frame society's understanding of disability; the consequences of such formulations. Various media, including fiction, nonfiction, film, television, and memoirs, viewed through a wide range of analytical lenses. WR, HU RP

*** AMST 410a / HIST 166Ja / WGSS 409a, Asian American Women and Gender, 1830 to the Present** Mary Lui

Asian American women as key historical actors. Gender analysis is used to reexamine themes in Asian American history: immigration, labor, community, cultural representations, political organizing, sexuality, and marriage and family life. WR, HU

*** AMST 422b / ER&M 435b / HIST 151Jb, Writing Tribal Histories** Ned Blackhawk

Historical overview of American Indian tribal communities, particularly since the creation of the United States. Challenges of working with oral histories, government documents, and missionary records. WR, HU

*** AMST 435a / ANTH 366a, Inequality in America** Kathryn Dudley

Sociocultural dimensions of social inequality in the contemporary United States. Ways in which the socioeconomic processes that produce inequality are inextricably embedded in worlds of cultural meaning; how those meanings are constructed and embodied in everyday practice. Perspectives from anthropology, sociology, economics, history, and popular media. SO

*** AMST 439a / ER&M 439a, Fruits of Empire** Gary Okihiro

Readings, discussions, and research on imperialism and "green gold" and their consequences for the imperial powers and their colonies and neo-colonies. Spatially conceived as a world-system that enmeshes the planet and as earth's latitudes that divide the temperate from the tropical zones, imperialism as discourse and material relations is this seminar's focus together with its implantations – an empire of plants. Vast plantations of sugar, cotton, tea, coffee, bananas, and pineapples occupy land cultivated by native and migrant workers, and their fruits move from the tropical to the temperate zones, impoverishing the periphery while profiting the core. Fruits of Empire, thus, implicates power and the social formation of race, gender, sexuality, class, and nation. HU, SO

*** AMST 441a / ER&M 370a / HIST 130Ja, Indians and the Spanish Borderlands** Ned Blackhawk

The experiences of Native Americans during centuries of relations with North America's first imperial power, Spain. The history and long-term legacies of Spanish colonialism from Florida to California. WR, HU

*** AMST 451a / HIST 174Ja / RLST 260a, Religion, War, and the Meaning of America** Harry Stout

The relationship between religion and war in American history from colonial beginnings through Vietnam. The religious meanings of Americans at war; the mutually reinforcing influences of nationalism and religion; war as the norm of American national life; the concept of civil religion; biblical and messianic contexts of key U.S. conflicts. HU

*** AMST 462a / ER&M 462a / WGSS 463a, The Study of Privilege in the Americas** Ana Ramos-Zayas

Examination of inequality, not only through experiences of the poor and marginal, but also through institutions, beliefs, social norms, and everyday practices of the privileged. Topics include: critical examination of key concepts like "studying up," "elite," and "privilege," as well as variations in forms of capital; institutional sites of privilege (elite prep schools, Wall Street); living spaces and social networks (gated communities, private clubs); privilege in intersectional contexts (privilege and race,

class, and gender); and everyday practices of intimacy and affect that characterize, solidify, and promote privilege. SO

*** AMST 463a and AMST 464b / EVST 463a and EVST 464b / FILM 455a and FILM 456b, Documentary Film Workshop** Charles Musser

A yearlong workshop designed primarily for majors in Film and Media Studies or American Studies who are making documentaries as senior projects. Seniors in other majors admitted as space permits. RP

*** AMST 466b / ENGL 444b, Contemporary Historical Novels** James Berger

Attempts of contemporary American authors to put the complexities of history into written form. Narrative as the privileged mode of historical representation; differences between what is regarded as academic history, popular history, and historical fiction; the influence of power and of the writer's own historical position on historical narrative; effects of ethnicity, gender, and race on the creation and reception of history; writers' use of historical fiction to change the ways readers think about the present and the future. HU

*** AMST 472b, Individual Reading and Research for Juniors and Seniors** Staff

Special projects intended to enable the student to cover material not otherwise offered by the program. The course may be used for research or for directed reading, but in either case a term paper or its equivalent is required as evidence of work done. It is expected that the student will meet regularly with the faculty adviser. To apply for admission, a student should submit a prospectus signed by the faculty adviser to the director of undergraduate studies.

*** AMST 486a / ER&M 425a, Asian American Studies of Race, Colonialism, and Empire** Lisa Lowe

This interdisciplinary course examines three periods of Asian American history that are paradigmatic within Asian American Studies of race, colonialism, and empire: 19th century Chinese immigrant labor, the internment of Japanese and Japanese Americans during World War II, and Korean Americans in 1992 Los Angeles. Studying these three examples in their national and global contexts, we consider Chinese immigrant railroad workers in relation to both conditions for emigration from China, and to Native American responses to U.S. settlement and expansion into the western frontier; the dispossession and incarceration of Japanese Americans in relation to wartime racialization of Mexican Americans, Blacks, and the longer history of U.S. war in Asia; and finally, we seek to understand the positioning of Korean Americans as "middlemen" in post-Civil Rights multiracial Los Angeles in relation to Korean War, and U.S. development and investment in the industrialization of South Korea. We explore how Asian American histories of racialized labor and citizenship in the U.S. are better understood in comparative relation to the histories of other groups, and with consideration of the longer histories of U.S. interventions in Asian countries of origin.

HU

Special Projects and Senior Project

*** AMST 471a and AMST 472b, Individual Reading and Research for Juniors and Seniors** Staff

Special projects intended to enable the student to cover material not otherwise offered by the program. The course may be used for research or for directed reading, but in

either case a term paper or its equivalent is required as evidence of work done. It is expected that the student will meet regularly with the faculty adviser. To apply for admission, a student should submit a prospectus signed by the faculty adviser to the director of undergraduate studies.

*** AMST 491a or b, Senior Project** Staff

Independent research and proseminar on a one-term senior project. For requirements see under “Senior requirement” in the American Studies program description.

*** AMST 493a and AMST 494b, Senior Project for the Intensive Major** Staff

Independent research and proseminar on a two-term senior project. For requirements see under “Senior requirement” in the American Studies program description.

*** AMST 494b, Senior Project for the Intensive Major** Staff

Independent research and proseminar on a two-term senior project. For requirements see under “Senior requirement” in the American Studies program description.

Anthropology

Director of undergraduate studies: William Honeychurch
(william.honeychurch@yale.edu), Rm. 305, 51 Hillhouse Ave., 432-3676;
anthropology.yale.edu

The major in Anthropology gives a firm grounding in this comparative discipline concerned with human cultural, social, and biological diversity. Anthropology deals not only with that small proportion of humankind in Europe and North America but with societies of the entire world from the remotest past to the present day. It is thus an essential part of a sound liberal education, helping us to see our world from a perspective that challenges ethnocentric assumptions. The major in Anthropology covers the evolution of human and nonhuman primates and the evolutionary biology of living people; world prehistory and the emergence of civilization; diversity and commonality in social organization and culture; the importance of culture for understanding such topics as sickness and health, gender and sexuality, environment and development, media and visual culture, urban life and sport, economic organization and politics, law and society, migration, and religion; and language use as cultural behavior.

The subfields of anthropological inquiry—archaeology, biological anthropology, sociocultural anthropology, and linguistic anthropology—together offer a holistic perspective on humankind and its development.

REQUIREMENTS OF THE MAJOR

Students are required to present twelve course credits toward their major. At least eight term courses must be taught in the Department of Anthropology. These eight must include an introductory or intermediate course (numbered ANTH 001–299) in each of at least three subfields of anthropology; three advanced courses (numbered ANTH 300–470 or 473–490, not including a senior essay seminar); and two electives. Additionally, all students must prepare a senior essay in ANTH 491 or another Anthropology seminar. Majors may take up to three cognate courses in departments other than Anthropology.

Three term courses related to anthropology may be selected from other departments, with approval by the director of undergraduate studies (DUS). Majors are not required to present such cognate courses, but those who do should choose courses that expand their knowledge in one of the subfields of anthropology or in an area of cross-disciplinary concentration. For example, cognate courses for biological anthropology can be found in Ecology and Evolutionary Biology, Geology and Geophysics, Psychology, and Forestry & Environmental Studies; cognates for sociocultural anthropology can be found in Sociology, American Studies, History, Environmental Studies, Religious Studies, Global Affairs, and international and area studies. Appropriate areas of cross-disciplinary concentrations include such topics as area studies (e.g., Africa); anthropological approaches to law, environment, business, the built environment, and health; gender and sexuality studies; evolutionary biology; and geology.

Areas of concentration The major does not have formal tracks, but majors may choose to concentrate in one of the subfields of anthropology. They may also draw on courses

in sociocultural and biological anthropology to pursue a concentration in medical anthropology. Those who concentrate in sociocultural anthropology are strongly encouraged to take a course in ethnographic methods and one in anthropological theory (e.g., ANTH 303 or 311). Those who concentrate in biological anthropology are strongly encouraged to take courses that give them hands-on experience working with material used in the study of human and nonhuman primate anatomy and evolution and that introduce them to laboratory methods.

Credit/D/Fail A maximum of one course taken Credit/D/Fail may be applied toward the Anthropology major.

SENIOR REQUIREMENT

All majors are required to complete a substantial paper during the senior year, either in a seminar or in ANTH 491. There are three options for completing the senior essay. First, students can write a paper for an advanced seminar. A seminar senior essay must be more substantial than a typical term paper and is expected to be 20–25 pages long. It is evaluated by the seminar instructor and a second reader drawn from the Yale faculty. Students must obtain written approval for this option from the seminar instructor no later than the third week of the term. Students fulfilling the requirements of two majors may not apply a single seminar essay toward the senior requirement for both majors. The deadline for a seminar senior essay is the senior essay deadline, not the term paper deadline. Students choosing this option must take the seminar for which they write their essay in addition to the three advanced courses required for the major.

The second option for the senior essay is an independent essay on a subject of the student's choice, completed in ANTH 491. A student pursuing this option must choose a topic and identify a faculty adviser by the end of the third week of the term in which the essay is to be written. By the same date, the adviser must approve a prospectus that outlines the topic, objectives, and methods of the essay, as well as a preliminary bibliography. The student should also inform the DUS of a preferred second reader by this time. The adviser must have a faculty appointment in Anthropology, and the second reader must have a faculty appointment at Yale.

The third option for the senior essay is a yearlong paper, begun in ANTH 471 or 472 and completed in ANTH 491. The yearlong essay is designed for students who wish to pursue more extensive independent projects than can be completed in a single term. Students must have their project approved by a faculty adviser who establishes the requirements for ANTH 471 or 472. Approval is required before the student registers for ANTH 471 or 472, typically in the fall term of the senior year.

ADVISING

With permission of the DUS, students may apply up to two courses taken outside Yale as electives or cognates toward the Anthropology major. Such courses must have been approved for Yale College credit and may include courses taken on a Year or Term Abroad or through summer study at another college or university.

Graduate courses Most graduate seminars in anthropology are open to qualified undergraduates. Descriptions are available in the departmental office, 10 Schem St. Permission of the instructor and of the director of graduate studies is required.

STUDY ABROAD

Study abroad courses that are approved for Yale College and Anthropology credit may be used to replace one elective. If more than one such study abroad course credit is to be used for the major, it will come at the expense of one or more of the three cognate courses which may be taken in any Yale department or program with the approval of the DUS in Anthropology.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 12 course credits (incl senior req)

Distribution of courses At least 1 intro survey or intermediate course in each of 3 subfields; 3 advanced courses (not incl senior essay sem); 2 electives; up to 3 cognate courses in other depts or programs with DUS approval

Substitution permitted 1 study abroad course for 1 ANTH elective

Senior requirement Senior essay in advanced sem; ANTH 491; or a yearlong essay to include ANTH 471 or 472 in addition to ANTH 491

FACULTY OF THE DEPARTMENT OF ANTHROPOLOGY

Professors †Claire Bower, Richard Bribiescas, Richard Burger, †Michael Dove (*Forestry & Environmental Studies*), Kathryn Dudley (*American Studies*), J. Joseph Errington, Eduardo Fernandez-Duque, †Inderpal Grewal (*Women's, Gender & Sexuality Studies*), Marcia Inhorn (*Modern Middle East Studies*), William Kelly, Paul Kockelman, Roderick McIntosh, Catherine Panter-Brick, Eric Sargis, James Scott (*Political Science*), Helen Siu, Kalyanakrishnan Sivaramakrishnan, Anne Underhill (*Chair*), Claudia Valeggia, David Watts

Associate Professors Aimee Cox, Erik Harms, William Honeychurch, Douglas Rogers

Assistant Professors Oswaldo Chinchilla, Louisa Lombard, Lisa Messeri, Jessica Thompson

Senior Lecturer †Carol Carpenter

†A joint appointment with primary affiliation in another department or school.

Courses

* **ANTH 011a, Reproductive Technologies** Marcia Inhorn

Introduction to scholarship on the anthropology of reproduction. Focus on reproductive technologies such as contraceptives, prenatal diagnostics, childbirth technologies, abortion, assisted reproduction, surrogacy, and embryonic stem cells. The globalization of reproductive technologies, including social, cultural, legal, and ethical responses. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SO

* **ANTH 061a, Understanding Human Origins** Jessica Thompson

This course deals with scientific questions of what we know about human origins and human evolution. It presents evidence from evolutionary and life history theory, geochronology, paleontology, paleoenvironmental reconstruction, phylogenetic analysis, genetics, archaeology, and functional morphology. It also tackles the issue of how we know what we think we know of our own ancestry over the past 6 million years. In other words, what constitutes evidence for human evolution and how is that

evidence interpreted? Students are introduced to basic milestones in human evolution and learn how they have shaped us into the species we are today, using diverse lines of evidence from evolutionary and life history theory, geochronology, paleontology, paleoenvironmental reconstruction, phylogenetic analysis, genetics, archaeology, and functional morphology. We critically examine key debates that have taken place over the last century of exploration in human evolutionary research, learning how unconventional thinking and spectacular discoveries have shaped current knowledge of our origins. Students meet strange and fascinating historical characters, and then meet our fossil ancestors via the cast collection. Students also receive hands-on and interactive learning about the morphology, life history patterns, locomotion, social behavior, and diet of our nearest fossil relatives; observe living primates to assess what they can tell us about our own deep past; dive into data collection by locating real archaeological and fossil sites; and learn how molecular techniques such as ancient DNA have transformed understanding of the origins of our own species. By formally debating controversial issues with classmates, students learn what a surprising amount of information scientists can discern from fragmentary fossils, and are brought up to date with the most current discoveries in human evolution. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SO

ANTH 110b, An Introduction to Cultural Anthropology Erik Harms

Anthropological study of cosmology, tacit knowledge, and ways of knowing the world in specific social settings. Ways in which sociocultural specificity helps to explain human solutions to problems of cooperation and conflict, production and reproduction, expression, and belief. Introduction to anthropological ways of understanding cultural difference in approaches to sickness and healing, gender and sexuality, economics, religion, and communication. SO

ANTH 116a, Introduction to Biological Anthropology Jessica Thompson

Introduction to human and primate evolution, primate behavior, and human biology. Topics include a review of principles of evolutionary biology and basic molecular and population genetics; the behavior, ecology, and evolution of nonhuman primates; the fossil and archaeological record for human evolution; the origin of modern humans; biological variation in living humans; and the evolution of human behavior. SC, SO

ANTH 171a / ARCG 171a, Great Civilizations of the Ancient World Staff

A survey of selected prehistoric and historical cultures through examination of archaeological sites and materials. Emphasis on the methodological and theoretical approaches by which archaeologists recover, analyze, and interpret the material remains of the past. SO

ANTH 172b / ARCG 172b, Great Hoaxes and Fantasies in Archaeology William Honeychurch

Examination of selected archaeological hoaxes, cult theories, and fantasies; demonstration of how archaeology can be manipulated to authenticate nationalistic ideologies, religious causes, and modern stereotypes. Examples of hoaxes and fantasies include the lost continent of Atlantis, Piltdown man, ancient giants roaming the earth, and alien encounters. Evaluation of how, as a social science, archaeology is capable of rejecting such interpretations about the past. SO

ANTH 205a / ANTH 368, Language, Culture, and Identity J. Joseph Errington
Introduction to the role of language in the constitution of gendered, class, ethnic, and national identities. Ethnographic and linguistic case studies are combined with theoretical and comparative approaches. Enrollment limited to 40. (Formerly ANTH 120) SO

ANTH 211a or b / AFAM 231a or b / WGSS 219a / WGSS 436b, Sex and Gender in the Black Diaspora Riché Barnes

A critical survey of images, rhetorics, experiences, and practices of gender and sexuality formation of black subjects in Africa, the Caribbean, western Europe, and the United States. Construction of class, nationality, race, color, sexuality, and gender. SO

ANTH 215b / ARCG 215b, Archaeology of China Anne Underhill

Archaeology of China, one of the world's oldest and most enduring civilizations, from the era of early humans to early empires. Methods of interpreting remains from prehistoric and historic period sites. SO

*** ANTH 241b / EAST 406b, Nature and Culture in and of East Asia** Staff

How is nature in East Asia shaped by distinct histories of modernization, colonialism, militarism, the Cold War, and developmentalism in the region? What is the impact of transnational flows of objects, people, ideas, and discourses – whether they are natural resources, waste, environmental activists, or green urbanism – on nature? How do recent anxieties about adulterated food, radiation, and pollution reveal environmental interconnections among Japan, China, Taiwan, Hong Kong, Korea, and beyond? Why are marginalized groups like Okinawans, indigenous people, and rural poor peasants disproportionately affected by environmental problems? By addressing such questions, this course aims to unpack the relationship between nature, culture, and power in East Asia. Reading interdisciplinary accounts from history, anthropology, and literary and cultural studies, we engage the growing field of environmental humanities from a uniquely East Asian perspective. Topics include the relationship between East Asian colonial experience and nature; state power and water resources; air pollution; nuclear radiation; the emergence of environmental conservation discourse; interspecies connections; and food safety. SO

ANTH 244a, Social Change in Contemporary Southeast Asia Eve Zucker

This course examines a number of significant forms of social change occurring in Southeast Asia in recent years. Fueled by new digital technologies; environmental change; globalized economies, politics, human rights, and religion – Southeast Asia is experiencing a rapid transformation. Some of these changes are visible such as the ubiquitous use of mobile phones, transformed city skylines, rampant deforestation, and changing infrastructure. However, some are less visible such as the forced evacuations of the poor from urban centers, increasing state surveillance, and new forms of relationships between people and places enabled through digital communications. Topics include migration, politics and political activism, urban development, environmentalism, labor, violence, religion, popular culture, gender, and relationships. Principle readings include key works from a range of disciplines and represent a number of Southeast Asian nations. The course includes a visual component through a number of in class film screenings. SO

*** ANTH 253b / ARCG 253b, Introduction to Experimental Archaeology** Roderick McIntosh and Ellery Frahm

Experimental archaeology is one of the most important tools to develop and test models which link human behaviors and natural forces to the archaeological record. This class explores the elements of good experimental design and procedures. ANTH 316L, ARCG 316L recommended. SO

ANTH 264b / ARCG 264b / SPAN 404b, Aztec Archaeology and Ethnohistory
Oswaldo Chinchilla Mazariegos

An anthropological and ethnohistorical examination of the Aztec civilization that dominated much of Mexico from the fourteenth century until the Spanish Conquest of 1521. SO

ANTH 272b / AFST 272b / ARCG 272b, African Prehistory Jessica Thompson and Roderick McIntosh

Survey of archaeological evidence for the original contributions of the African continent to the human condition. The unresolved issues of African prehistory, from the time of the first hominids, through development of food production and metallurgy, to the rise of states and cities. SO

ANTH 276b / SAST 219b, South Asian Social Worlds Staff

Study of a series of texts that introduce anthropological and critical approaches to South Asia's peoples and cultures while questioning the historical and political possibility of understanding such a diverse region. WR, SO

ANTH 300a / E&EB 300a / EVST 182a, Primate Behavior and Ecology Eduardo Fernandez-Duque

Socioecology of primates compared with that of other mammals, emphasizing both general principles and unique primate characteristics. Topics include life-history strategies, feeding ecology, mating systems, and ecological influences on social organization. SC, SO

ANTH 316La / ARCG 316La, Introduction to Archaeological Laboratory Sciences
Ellery Frahm and Roderick McIntosh

Introduction to techniques of archaeological laboratory analysis, with quantitative data styles and statistics appropriate to each. Topics include dating of artifacts, sourcing of ancient materials, remote sensing, and microscopic and biochemical analysis. Specific techniques covered vary from year to year.

*** ANTH 322a / EVST 324a / SAST 306a, Environmental Justice in South Asia** Staff
Study of South Asia's nation building and economic development in the aftermath of war and decolonization in the 20th century. How it generated unprecedented stress on natural environments; increased social disparity; and exposure of the poor and minorities to environmental risks and loss of homes, livelihoods, and cultural resources. Discussion of the rise of environmental justice movements and policies in the region as the world comes to grips with living in the Anthropocene. SO

*** ANTH 339b, Urban Ethnography of Asia** Staff

Introduction to the anthropological study of contemporary Asian cities. Focus on new ethnographies about cities in East, Southeast, and South Asia. Topics include rural-urban migration, redevelopment, evictions, social movements, land grabbing, master-

planned developments, heritage preservation, utopian aspirations, social housing, slums and precariousness, and spatial cleansing. SO

* **ANTH 342a, Cultures and Markets in Asia** Helen Siu

Historical and contemporary movements of people, goods, and cultural meanings that have defined Asia as a region. Reexamination of state-centered conceptualizations of Asia and of established boundaries in regional studies. The intersections of transregional institutions and local societies and their effects on trading empires, religious traditions, colonial encounters, and cultural fusion. Finance flows that connect East Asia and the Indian Ocean to the Middle East and Africa. The cultures of capital and market in the neoliberal and postsocialist world. SO

* **ANTH 346b, Anthropological Approaches to Capitalism** Douglas Rogers

An introduction to the anthropological study of capitalism. Focus on how markets and commodities are embedded in social, cultural, and political contexts. Discussion of the many ways people have embraced, reinterpreted, and resisted capitalism worldwide. Consideration of the implications of this diversity for theories of capitalism as a whole. Enrollment limited to sophomores. SO

* **ANTH 366a / AMST 435a, Inequality in America** Kathryn Dudley

Sociocultural dimensions of social inequality in the contemporary United States. Ways in which the socioeconomic processes that produce inequality are inextricably embedded in worlds of cultural meaning; how those meanings are constructed and embodied in everyday practice. Perspectives from anthropology, sociology, economics, history, and popular media. SO

* **ANTH 379a / AFAM 378a, Anthropology of the Young and the Dispossessed** Aimee Cox

This seminar explores how anthropologists have theorized the category of youth and represented those considered to be young people in ethnographies. After the first two weeks of course orientation to the concepts of adolescence, paternalism, socialization, and rehabilitation, students read one ethnographic work a week that allows the class to interrogate these concepts as they appear in the scholarship of both anthropologists and non-anthropologists. Students discern how some of the same definitions and assumptions used to define “youth” are mapped onto representations of those communities that have historically been dispossessed. HU, SO

* **ANTH 381b / WGSS 378b, Sex and Global Politics** Graeme Reid

Global perspectives on the sexual politics of gender identity, sexual orientation, and human rights. Examination of historical, cultural, and political aspects of sexual orientation and gender identity in the context of globalization. SO

* **ANTH 382a / ER&M 395a / EVST 345a / F&ES 384a, Environmental Anthropology** Michael Dove

The history and contemporary study of anthropology and the environment, with special attention to current debates regarding human environmental relations. Topics include: nature-culture dichotomy; ecology and social organization; methodological debates; politics of the environment; and knowing the environment. SO

* **ANTH 385b / ARCG 385b, Archaeological Ceramics** Anne Underhill

Archaeological methods for analyzing and interpreting ceramics, arguably the most common type of object found in ancient sites. Focus on what different aspects of ceramic vessels reveal about the people who made them and used them. SO

* **ANTH 388a, Politics of Culture in Southeast Asia** Eve Zucker

The promotion of national culture as part of political and economic agendas in Southeast Asia. Cultural and political diversity as a method for maintaining a country's cultural difference in a global world. SO

ANTH 399b, The Anthropology of Outer Space Lisa Messeri

Examination of the extraterrestrial through consideration of ideas in anthropology and aligned disciplines. Students discuss, write, and think about outer space as anthropologists and find the value of exploring this topic scientifically, socially, and philosophically. SO

* **ANTH 406a / EVST 424a / PLSC 420a, Rivers: Nature and Politics** James Scott

The natural history of rivers and river systems and the politics surrounding the efforts of states to manage and engineer them. SO

* **ANTH 413a, Language, Culture, and Ideology** J. Joseph Errington

Review of influential anthropological theories of culture, with reference to theories of language that inspired or informed them. American and European structuralism; cognitivist and interpretivist approaches to cultural description; the work of Bakhtin, Bourdieu, and various critical theorists. SO RP

* **ANTH 417a / ARCG 417a, Maya Hieroglyphic Writing** Oswaldo Chinchilla Mazariegos

Introduction to the ancient Maya writing system. Contents of the extant corpus, including nametags, royal and ritual commemorations, dynastic and political subjects, and religious and augural subjects; principles and methods of decipherment; overview of the Maya calendar; comparison with related writing systems in Mesoamerica and elsewhere in the ancient world. SO

* **ANTH 428b / PHIL 493b / RLST 428b, Neighbors and Others** Nancy Levene

This course is an interdisciplinary investigation of concepts and stories of family, community, borders, ethics, love, and antagonism. Otherwise put, it concerns the struggles of life with others – the logic, art, ethnography, and psychology of those struggles. The starting point is a complex of ideas at the center of religions, which are given to differentiating "us" from "them" while also identifying values such as the love of the neighbor that are to override all differences. But religion is only one avenue into the motif of the neighbor, a fraught term of both proximity and distance, a contested term and practice trailing in its wake lovers, enemies, kin, gods, and strangers. Who is my neighbor? What is this to ask, and what does the question ask of us? Course material includes philosophy, anthropology, psychology, fiction, poetry, and film. HU

* **ANTH 448a, Medical Anthropology at the Intersections: Theory and Ethnography** Staff

The field of medical anthropology boasts a rich theoretical and empirical tradition, in which critically acclaimed ethnographies have been written on topics ranging from local biologies to structural violence. Many scholars engage across the social science and humanities disciplines, as well as with medicine and public health, offering both critiques and applied interventions. This medical anthropology seminar showcases

the theoretical and ethnographic engagements of nearly a dozen leading medical anthropologists, with a focus on their canonical works and their intersections across disciplines. Prerequisite: A prior medical anthropology course or permission of instructor. SO

*** ANTH 450a / ARCG 450a, Analysis of Lithic Technology** Staff

Introduction to the analysis of chipped and ground stone tools, including instruction in manufacturing chipped stone tools from obsidian. Review of the development of stone tool technology from earliest tools to those of historical periods; relevance of this technology to subsistence, craft specialization, and trade. Discussion of the recording, analysis, and drawing of artifacts, and of related studies such as sourcing and use-wear analysis. SO

*** ANTH 451b / WGSS 431b, Intersectionality and Women's Health** Marcia Inhorn

The intersections of race, class, gender, and other axes of "difference" and their effects on women's health, primarily in the contemporary United States. Recent feminist approaches to intersectionality and multiplicity of oppressions theory. Ways in which anthropologists studying women's health issues have contributed to social and feminist theory at the intersections of race, class, and gender. SO

*** ANTH 462b, Ethnographic Perspectives on Global Health** Marcia Inhorn

Study of anthropological ethnographies on serious health problems facing populations in resource-poor societies. Poverty and structural violence; health as a human right; struggles with infectious disease; the health of women and children. Focus on health issues facing sub-Saharan Africa and Latin America. SO RP

ANTH 464b / ARCG 464b / E&EB 464b, Human Osteology Eric Sargis

A lecture and laboratory course focusing on the characteristics of the human skeleton and its use in studies of functional morphology, paleodemography, and paleopathology. Laboratories familiarize students with skeletal parts; lectures focus on the nature of bone tissue, its biomechanical modification, sexing, aging, and interpretation of lesions. SC, SO

*** ANTH 471a or b and ANTH 472a, Readings in Anthropology** Staff

For students who wish to investigate an area of anthropology not covered by regular departmental offerings. The project must terminate with at least a term paper or its equivalent. No student may take more than two terms for credit. To apply for admission, a student should present a prospectus and bibliography to the director of undergraduate studies no later than the third week of the term. Written approval from the faculty member who will direct the student's reading and writing must accompany the prospectus.

*** ANTH 482b / ARCG 482b, Advanced Archaeological Theory** Roderick McIntosh

Review of the intellectual history of archaeology, with readings from the Enlightenment to the present. Emphasis on the tension between science, mysticism, and nationalism in the interpretation of prehistoric processes. SO RP

*** ANTH 491a or b, The Senior Essay** Staff

Supervised investigation of some topic in depth. The course requirement is a long essay to be submitted as the student's senior essay. By the end of the third week of the term in which the essay is written, the student must present a prospectus and a preliminary bibliography to the director of undergraduate studies. Written approval

from an Anthropology faculty adviser and an indication of a preferred second reader must accompany the prospectus.

Applied Mathematics

Director of undergraduate studies: John Wettlaufer (john.wettlaufer@yale.edu), Rm. 109 KGL, 432-0892

Mathematical models are widely used throughout science and engineering in fields as diverse as physics, bioinformatics, robotics, image processing, and economics. Despite the broad range of mathematical settings and applications, there is a core of essential concepts and techniques used in addressing most problems. The Applied Mathematics major provides a foundation in these mathematical techniques and trains the student to use them in a substantive field of application.

The interdisciplinary major permits a great deal of flexibility in design. It is intended to appeal to students who wish to study the more mathematical aspects of science or engineering, as well as those whose primary interest is in mathematics and statistics and who wish to become acquainted with applications. Core courses are drawn from Computer Science, Mathematics, Statistics and Data Science, and Engineering and Applied Science. Courses applying mathematics may be drawn from participating programs in Applied Physics; Astronomy; the biological sciences, including Ecology and Evolutionary Biology, Molecular Biophysics and Biochemistry, and Molecular, Cellular, and Developmental Biology; Chemistry; Economics; the various programs in engineering, including Biomedical, Chemical, Electrical, Environmental, and Mechanical Engineering and Materials Science; Geology and Geophysics; Physics; and even Linguistics and Political Science. The Applied Mathematics degree program requires a three-course concentration in a field in which mathematics is used.

Students in the major are often sought after by graduate programs in either Applied Mathematics or in the disciplines in which they choose their concentration, as well as by industries and startup companies in which their breadth of quantitative skills are essential.

Students may pursue a major in Applied Mathematics as one of two majors and can thereby equip themselves with mathematical modeling skills while being fully engaged in a field of application. In this case, the concentration requirement of the Applied Mathematics program is flexible in order to recognize the contribution of the other major. A two-course overlap is permitted in satisfying the requirements of the two majors.

PREREQUISITE AND INTRODUCTORY COURSES

Multivariable calculus and linear algebra are required and should be taken before or during the sophomore year. This requirement may be satisfied by MATH 120 or ENAS 151, and MATH 222 or 225 or equivalents. It may also be satisfied by MATH 230, 231. Computer programming skills are also required and may be acquired by taking ENAS 130, CPSC 100, or 112. Details of individual programs must be worked out in consultation with the director of undergraduate studies (DUS), whose signed permission is required.

REQUIREMENTS OF THE MAJOR

The B.A. degree program The program requires eleven term courses beyond the prerequisites, including the senior project, comprising a coherent program:

1. A course in differential equations (ENAS 194 or MATH 246).
2. A course in probability (S&DS 241 or S&DS 238).
3. A course in data analysis (S&DS 361 or S&DS 230).
4. A course in discrete mathematics (AMTH 244 or CPSC 202).
5. Courses in at least three of the following areas including, but not limited to: (a) optimization: AMTH 437; (b) probability and statistics: S&DS 242, S&DS 312, S&DS 364, ECON 136, ENAS 496; (c) partial differential equations and analysis: MATH 247, 250, 260, 300, 301, 310; (d) algorithms and numerical methods: CPSC 365, 440, ENAS 440, 441; (e) graph theory: AMTH 462; (f) mathematical economics: ECON 350, 351; (g) electrical engineering: EENG 397, 436, EENG 442, S&DS 364; (h) data mining and machine learning: S&DS 365, CPSC 445; (i) biological modeling and computation: CPSC 475, BENG 445, ENAS 391; (j) physical sciences: ASTR 320, 420, G&G 322, 323, 421, 428, 456, PHYS 344, 342, 401, 402, 410, 420, 430, 440, 442, 460, APHY 439, 448; (k) engineering: MENG 280, 285, 361, 383, 463, 469, CENG 301, 315. Because departmental curricula from which the program draws regularly change, the DUS maintains a more exhaustive list of courses satisfying this particular requirement.
6. At least *three advanced courses* in a field of concentration involving the application of mathematics to that field. Programs in science, engineering, computer science, statistics, and economics are natural sources of concentration. Alternatively, when two majors are undertaken, if the second major is in a participating program, then, recognizing that there can be an overlap of two courses, the student may take for the remaining course an additional choice relevant to the Applied Mathematics major such as listed in point 5 above or for the B.S. below. Details of a student's program to satisfy the concentration requirement must be worked out in consultation with, and approved by, the DUS.

The B.S. degree program In addition to the courses indicated for the B.A. degree, the B.S. degree, which totals fourteen term courses beyond the prerequisites, must also include:

1. Topics in analysis (MATH 300) or introduction to analysis (MATH 301); the course selected may not be counted toward the area requirement for the major (see item 5 above).
2. An additional course selected from the list in item 5 above.
3. Another course numbered 300 or higher from the list above, or a course numbered 300 or higher in mathematics, applied mathematics, statistics, or quantitative computer science or engineering, subject to the approval of the DUS.

Alternatively, students may petition to receive a B.S. in Applied Mathematics by fulfilling the B.A. requirements in Applied Mathematics and the B.S. requirements in another program.

Credit/D/Fail A maximum of one course credit taken Credit/D/Fail may be counted toward the requirements of the major.

SENIOR REQUIREMENT

Both the B.A. and B.S. degree programs require a senior seminar and project (AMTH 490), or a special project completed during senior year (AMTH 491).

REQUIREMENTS OF THE MAJOR

Prerequisites MATH 120 or ENAS 151, and MATH 222 or 225, or equivalents; ENAS 130, CPSC 100, or 112

Number of courses B.A. – 11 term courses beyond prereqs (incl senior req); B.S. – 14 term courses beyond prereqs (incl senior req)

Specific courses required B.A. – ENAS 194 or MATH 246; S&DS 241 or S&DS 238; S&DS 361 or S&DS 230; AMTH 244 or CPSC 202; B.S. – same, plus MATH 300 or 301

Distribution of courses B.A. – at least 3 advanced courses in a field of concentration concerning the application of math to that field; 3 addtl courses as specified; B.S. – same, with 2 addtl courses as specified

Substitution permitted MATH 230, 231 for mathematics prerequisites

Senior requirement Senior sem (AMTH 490) or special project (AMTH 491)

FACULTY ASSOCIATED WITH THE PROGRAM OF APPLIED MATHEMATICS

Professors Andrew Barron (*Statistics & Data Science*), David Bercovici (*Geology & Geophysics*), Donald Brown (*Emeritus*) (*Economics, Mathematics*), Joseph Chang (*Statistics*), Ronald Coifman (*Mathematics*), Stanley Eisenstat (*Computer Science*), Michael Fischer (*Computer Science*), Igor Frenkel (*Mathematics*), Roger Howe (*Emeritus*) (*Mathematics*), Peter Jones (*Mathematics*), John Lafferty (*Statistics & Data Science*), A. Stephen Morse (*Electrical Engineering*), David Pollard (*Statistics*), Nicholas Read (*Physics, Applied Physics*), Vladimir Rokhlin (*Computer Science, Mathematics*), Peter Schultheiss (*Emeritus*) (*Electrical Engineering*), Martin Schultz (*Emeritus*) (*Computer Science*), Mitchell Smooke (*Mechanical Engineering, Applied Physics*), Daniel Spielman (*Computer Science, Statistics & Data Science*), Mary-Louise Timmermans (*Geology & Geophysics*), Van Vu (*Mathematics*), Günter Wagner (*Ecology & Evolutionary Biology*), John Wettlaufer (*Geology & Geophysics, Mathematics, Physics*), Huibin Zhou (*Statistics & Data Science*), Steven Zucker (*Computer Science, Biomedical Engineering*)

Associate Professors John Emerson (*Statistics*), Thierry Emonet (*Molecular, Cellular, & Developmental Biology, Physics*), Josephine Hoh (*Epidemiology & Public Health*), Yuval Kluger (*Pathology*), Michael Krauthammer (*Pathology*), Sekhar Tatikonda (*Electrical Engineering, Statistics & Data Science*)

J. W. Gibbs Assistant Professors Asher Auel, Ross Berkowitz, Ariel Jaffe, Gal Mishne

Introductory Courses

AMTH 160b / MATH 160b / S&DS 160b, The Structure of Networks Ronald Coifman

Network structures and network dynamics described through examples and applications ranging from marketing to epidemics and the world climate. Study of social and biological networks as well as networks in the humanities. Mathematical graphs provide a simple common language to describe the variety of networks and their properties. QR

AMTH 222a or b / MATH 222a or b, Linear Algebra with Applications Staff
Matrix representation of linear equations. Gauss elimination. Vector spaces. Linear independence, basis, and dimension. Orthogonality, projection, least squares

approximation; orthogonalization and orthogonal bases. Extension to function spaces. Determinants. Eigenvalues and eigenvectors. Diagonalization. Difference equations and matrix differential equations. Symmetric and Hermitian matrices. Orthogonal and unitary transformations; similarity transformations. After MATH 115 or equivalent. May not be taken after MATH 225. QR

Intermediate and Advanced Courses

AMTH 244a or b / MATH 244a or b, Discrete Mathematics Staff

Basic concepts and results in discrete mathematics: graphs, trees, connectivity, Ramsey theorem, enumeration, binomial coefficients, Stirling numbers. Properties of finite set systems. Recommended preparation: MATH 115 or equivalent. QR

AMTH 247a / G&G 247a / MATH 247 / MATH 447a, Partial Differential Equations

Wilhelm Schlag

Introduction to partial differential equations, wave equation, Laplace's equation, heat equation, method of characteristics, calculus of variations, series and transform methods, and numerical methods. Prerequisites: MATH 222 or 225, MATH 246, and ENAS 194, or equivalents. QR

AMTH 262a / CPSC 362a / S&DS 262a, Computational Tools for Data Science Roy

Lederman

Introduction to the core ideas and principles that arise in modern data analysis, bridging statistics and computer science and providing students the tools to grow and adapt as methods and techniques change. Topics include principle component analysis, independent component analysis, dictionary learning, neural networks and optimization, as well as scalable computing for large datasets. Assignments will include implementation, data analysis and theory. Students require background in linear algebra, multivariable calculus, probability and programming. Prerequisites: after or concurrently with MATH 222, 225, or 231; after or concurrently with MATH 120, 230, or ENAS 151; after or concurrently with CPSC 100, 112, or ENAS 130; after S&DS 100-108 or S&DS 230 or S&DS 241 or S&DS 242. QR

* **AMTH 342a / EENG 432, Linear Systems** A. Stephen Morse

Introduction to finite-dimensional, continuous, and discrete-time linear dynamical systems. Exploration of the basic properties and mathematical structure of the linear systems used for modeling dynamical processes in robotics, signal and image processing, economics, statistics, environmental and biomedical engineering, and control theory. Prerequisite: MATH 222 or permission of instructor. QR

AMTH 361b / S&DS 361b, Data Analysis Staff

Selected topics in statistics explored through analysis of data sets using the R statistical computing language. Topics include linear and nonlinear models, maximum likelihood, resampling methods, curve estimation, model selection, classification, and clustering. After S&DS 242 and MATH 222 or 225, or equivalents. QR

AMTH 364b / EENG 454b / S&DS 364b, Information Theory Andrew Barron

Foundations of information theory in communications, statistical inference, statistical mechanics, probability, and algorithmic complexity. Quantities of information and their properties: entropy, conditional entropy, divergence, redundancy, mutual information, channel capacity. Basic theorems of data compression, data summarization, and channel coding. Applications in statistics and finance. After STAT 241. QR

AMTH 420a / MATH 421a, The Mathematics of Data Science Stefan Steinerberger

This course aims to be an introduction to the mathematical background that underlies modern data science. The emphasis is on the mathematics but occasional applications are discussed (in particular, no programming skills are required). Covered material may include (but is not limited to) a rigorous treatment of tail bounds in probability, concentration inequalities, the Johnson-Lindenstrauss Lemma as well as fundamentals of random matrices, and spectral graph theory. Prerequisite: MATH 305. QR, SC

AMTH 428a / E&EB 428a / G&G 428a / PHYS 428a, Science of Complex Systems Jun Korenaga

Introduction to the quantitative analysis of systems with many degrees of freedom. Fundamental components in the science of complex systems, including how to simulate complex systems, how to analyze model behaviors, and how to validate models using observations. Topics include cellular automata, bifurcation theory, deterministic chaos, self-organized criticality, renormalization, and inverse theory. Prerequisite: PHYS 301, MATH 247, or equivalent. QR, SC

*** AMTH 437a / ECON 413a / EENG 437a / S&DS 430a, Optimization Techniques** Sekhar Tatikonda

Fundamental theory and algorithms of optimization, emphasizing convex optimization. The geometry of convex sets, basic convex analysis, the principle of optimality, duality. Numerical algorithms: steepest descent, Newton's method, interior point methods, dynamic programming, unimodal search. Applications from engineering and the sciences. Prerequisites: MATH 120 and 222, or equivalents. May not be taken after AMTH 237. QR

*** AMTH 480a or b, Directed Reading** John Wettlaufer

Individual study for qualified students who wish to investigate an area of applied mathematics not covered in regular courses. A student must be sponsored by a faculty member who sets the requirements and meets regularly with the student. Requires a written plan of study approved by the faculty adviser and the director of undergraduate studies.

*** AMTH 482a or b, Research Project** John Wettlaufer

Individual research. Requires a faculty supervisor and the permission of the director of undergraduate studies. The student must submit a written report about the results of the project. May be taken more than once for credit.

*** AMTH 490a or b, Senior Seminar and Project** John Wettlaufer

Under the supervision of a member of the faculty, each student works on an independent project. Students participate in seminar meetings at which they speak on the progress of their projects. Some meetings may be devoted to talks by visiting faculty members or applied mathematicians.

*** AMTH 491a or b, Senior Project** John Wettlaufer

Individual research that fulfills the senior requirement. Requires a faculty supervisor and the permission of the director of undergraduate studies. The student must submit a written report about the results of the project.

Applied Physics

Director of undergraduate studies: Daniel Prober (daniel.prober@yale.edu), 417 BCT, 432-4280; appliedphysics.yale.edu

Physics is the study of the fundamental laws of nature. Applied physics uses these laws to understand phenomena that have practical applications. Engineering in turn makes use of these phenomena for human purposes. Applied physics thus forms a link between the fundamental laws of nature and their applications. Students majoring in Applied Physics take courses in both physics and engineering, as well as courses specifically in applied physics. Students completing the program in Applied Physics are prepared for graduate study in applied physics, in physics, in nanoscience, or in engineering, and, with appropriate prerequisites, in medicine; or they may choose careers in a wide range of technical and commercial fields, or in fields such as technical writing or patent law that draw on interdisciplinary subjects.

Contemporary physical science and engineering are becoming increasingly interdisciplinary. Traditional boundaries between fields have blurred, and new areas are constantly emerging, e.g., nanotechnology. The Applied Physics major provides a flexible framework on which students can build a curriculum tailored to their own interests, in consultation with the director of undergraduate studies (DUS).

PREREQUISITES

During their first year, students interested in Applied Physics should start by taking courses in mathematics, and in physics if possible, appropriate to their level of preparation. The choice between different starting points is generally made on the basis of performance on Advanced Placement tests; see the First-Year Student Handbook for more information.

The multiplicity of choices facing students interested in this general area indicates the importance of informed advice for first-year students. Students should consult freely with DUSes and individual faculty members in their departments of interest to optimize choices and to ensure maximum flexibility at the time a major is selected.

The prerequisite requirements for the Class of 2021 and previous classes Students who declared their major under previous requirements must follow the prerequisite requirements as indicated when they declared.

The prerequisite requirements for the Class of 2022 and subsequent classes The required prerequisites for students interested in Applied Physics include two physics courses and one physics lab; APHY 151 or MATH 120; and PHYS 301 or APHY 194 with either MATH 222 or MATH 225.

The recommended starting courses in physics are PHYS 200 and 201. These courses should be taken in the first year by students who have a strong preparation in mathematics and physics. Students with a particularly strong background in physics and mathematics may take PHYS 260 and 261 instead. Students who are less well prepared in physics and mathematics may choose to take PHYS 180 and 181 during their first year, or PHYS 200 and 201 during their sophomore year after they have taken more mathematics courses. One laboratory course, PHYS 166L or 206L, should be taken at some time during the first or second year.

REQUIREMENTS OF THE MAJOR

The major in Applied Physics requires eight courses beyond the introductory sequence. Two of these must be APHY 471 and 472. All majors are also required to take APHY 322, 439, and 420, or equivalents. The three remaining advanced courses should focus on a particular area of concentration. For example, a student interested in solid-state and/or quantum electronics might choose from APHY 321, 448, 449, EENG 320, and 325. A student interested in the physics of materials and/or nanoscience might choose from APHY 448, 449, CHEM 220, 450, and MENG 285. Many other concentrations are possible.

Credit/D/Fail All courses required for the major, beyond the prerequisites, must be taken for a letter grade, with the single exception that one such course may be taken Credit/D/Fail with permission of the DUS. The senior special projects, APHY 471 and 472, may only be taken for a letter grade.

SENIOR REQUIREMENT

Seniors must complete an independent research project, taken as APHY 471 and 472. The independent research project is under the supervision of a faculty member in Applied Physics, Physics, Engineering, or related departments. The project may be started in the junior year and continued into the senior year. Students planning to do a research project should contact the DUS as early as possible to discuss available options and general requirements.

ADVISING

The Applied Physics major provides for various programs corresponding to a range of student interests. Substitutions of equivalent courses may be permitted. Students interested in an Applied Physics major should contact the DUS as early as possible, and in any case by the end of their sophomore year.

A well-prepared student interested in materials physics or quantum electronics who starts the senior research in the junior year might elect the following course sequence:

First-Year	Sophomore	Junior	Senior
APHY 151	APHY 322	APHY 472	APHY 448
PHYS 200	APHY 439	EENG 320	APHY 449
PHYS 201	PHYS 301	APHY 420	APHY 471
PHYS 206L			

A student interested in alternative energy who starts physics in the sophomore year and conducts research in the senior year might elect:

First-Year	Sophomore	Junior	Senior
MATH 120	PHYS 200	APHY 322	APHY 448
	PHYS 201	APHY 439	APHY 471
	PHYS 206L	EENG 320	APHY 472
	PHYS 301	APHY 420	EENG 406

REQUIREMENTS OF THE MAJOR

Prerequisites PHYS 180, 181, or 200, 201, with appropriate math coreqs and PHYS 166L or 206L; APHY 151 or MATH 120; PHYS 301 (or APHY 194 with either MATH 222 or MATH 225)

Number of courses 8 term courses beyond prereqs (incl senior req)

Distribution of courses 3 adv courses in physical or mathematical sciences or engineering in area of concentration, with DUS approval

Specific courses required APHY 322, 439, 420, or equivalents

Substitution permitted Any relevant course approved by DUS

Senior requirement APHY 471 and 472

FACULTY OF THE DEPARTMENT OF APPLIED PHYSICS

Professors Charles Ahn, †Sean Barrett, Hui Cao, Richard Chang (*Emeritus*), Michel Devoret, Paul Fleury (*Emeritus*), †Steven Girvin, †Leonid Glazman, †Jack Harris, Victor Henrich (*Emeritus*), Sohrab Ismail-Beigi, †Marshall Long, †Tso-Ping Ma, Simon Mochrie, †Corey O'Hern, Vidvuds Ozolins, Daniel Prober, Nicholas Read, †Mark Reed, Robert Schoelkopf, †Ramamurti Shankar, †Mitchell Smooke, A. Douglas Stone, †Hongxing Tang, Robert Wheeler (*Emeritus*), Werner Wolf (*Emeritus*)

Associate Professor Peter Rakich

Assistant Professors †Michael Choma, Owen Miller

†A joint appointment with primary affiliation in another department.

Courses

* **APHY 050a / PHYS 050a, Science of Modern Technology and Public Policy** Daniel Prober

Examination of the science behind selected advances in modern technology and implications for public policy, with focus on the scientific and contextual basis of each advance. Topics are developed by the participants with the instructor and with guest lecturers, and may include nanotechnology, quantum computation and cryptography, renewable energy technologies, optical systems for communication and medical diagnostics, transistors, satellite imaging and global positioning systems, large-scale immunization, and DNA made to order. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SC RP

* **APHY 100b / ENAS 100b / EVST 100b / G&G 105b / PHYS 100b, Energy Technology and Society** Daniel Prober

The technology and use of energy. Impacts on the environment, climate, security, and economy. Application of scientific reasoning and quantitative analysis. Intended for non-science majors with strong backgrounds in math and science. QR, SC RP

APHY 110b / ENAS 110b, The Technological World Owen Miller

An exploration of modern technologies that play a role in everyday life, including the underlying science, current applications, and future prospects. Examples include solar cells, light-emitting diodes (LEDs), computer displays, the global positioning system, fiber-optic communication systems, and the application of technological advances to medicine. For students not committed to a major in science or engineering; no college-

level science or mathematics required. Prerequisite: high school physics or chemistry.
QR, SC

APHY 151b / ENAS 151b / PHYS 151b, Multivariable Calculus for Engineers Beth
Anne Bennett

An introduction to multivariable calculus focusing on applications to engineering problems. Topics include vector-valued functions, vector analysis, partial differentiation, multiple integrals, vector calculus, and the theorems of Green, Stokes, and Gauss. Prerequisite: MATH 115 or equivalent. QR RP

APHY 194a / ENAS 194a, Ordinary and Partial Differential Equations with Applications Beth Anne Bennett

Basic theory of ordinary and partial differential equations useful in applications. First- and second-order equations, separation of variables, power series solutions, Fourier series, Laplace transforms. Prerequisites: ENAS 151 or equivalent, and knowledge of matrix-based operations. QR RP

APHY 293a / PHYS 293a, Einstein and the Birth of Modern Physics A. Douglas
Stone

The first twenty-five years of the 20th century represent a turning point in human civilization as for the first time mankind achieved a systematic and predictive understanding of the atomic level constituents of matter and energy, and the mathematical laws which describe the interaction of these constituents. In addition, the General Theory of Relativity opened up for the first time a quantitative study of cosmology, of the history of the universe as a whole. Albert Einstein was at the center of these breakthroughs, and also became an iconic figure beyond physics, representing scientist genius engaged in pure research into the fundamental laws of nature. This course addresses the nature of the transition to modern physics, underpinned by quantum and relativity theory, through study of Einstein's science, biography, and historical context. It also presents the basic concepts in electromagnetic theory, thermodynamics and statistical mechanics, special theory of relativity, and quantum mechanics which were central to this revolutionary epoch in science. Prerequisites: Two terms of PHYS 170, 171, or PHYS 180, 181, or PHYS 200, 201, or PHYS 260, 261, or one term of any of these course with permission of instructor. QR, SC

APHY 321b / EENG 403, Semiconductor Silicon Devices and Technology Tso-Ping
Ma

Introduction to integrated circuit technology, theory of semiconductor devices, and principles of device design and fabrication. Laboratory involves the fabrication and analysis of semiconductor devices, including Ohmic contacts, Schottky diodes, p-n junctions, solar cells, MOS capacitors, MOSFETs, and integrated circuits. Prerequisite: EENG 320 or equivalent or permission of instructor. QR, SC

APHY 322b, Electromagnetic Waves and Devices Robert Schoelkopf

Introduction to electrostatics and magnetostatics, time varying fields, and Maxwell's equations. Applications include electromagnetic wave propagation in lossless, lossy, and metallic media and propagation through coaxial transmission lines and rectangular waveguides, as well as radiation from single and array antennas. Occasional experiments and demonstrations are offered after classes. Prerequisites: PHYS 180, 181, or 200, 201. QR, SC

*** APHY 420a / PHYS 420a, Thermodynamics and Statistical Mechanics** Nir Navon

This course is subdivided into two topics. We study thermodynamics from a purely macroscopic point of view and then we devote time to the study of statistical mechanics, the microscopic foundation of thermodynamics. Prerequisites: PHYS 301, 410, and 440 or permission of instructor. QR, SC

APHY 439a / PHYS 439a, Basic Quantum Mechanics Robert Schoelkopf

The basic concepts and techniques of quantum mechanics essential for solid-state physics and quantum electronics. Topics include the Schrödinger treatment of the harmonic oscillator, atoms and molecules and tunneling, matrix methods, and perturbation theory. Prerequisites: PHYS 181 or 201, PHYS 301, or equivalents, or permission of instructor. QR, SC

APHY 448a / PHYS 448a, Solid State Physics I Sohrab Ismail-Beigi

The first term of a two-term sequence covering the principles underlying the electrical, thermal, magnetic, and optical properties of solids, including crystal structure, phonons, energy bands, semiconductors, Fermi surfaces, magnetic resonances, phase transitions, dielectrics, magnetic materials, and superconductors. Prerequisites: APHY 322, 439, PHYS 420. QR, SC

APHY 449b / PHYS 449b, Solid State Physics II Michel Devoret

The second term of the sequence described under APHY 448. QR, SC

*** APHY 450b / ENAS 450b / MENG 450b, Advanced Synchrotron Techniques and Electron Spectroscopy of Materials** Charles Ahn

Introduction to concepts of advanced x-ray and electron-based techniques used for understanding the electronic, structural, and chemical behavior of materials. Students learn from world-leading experts on fundamentals and practical applications of various diffraction, spectroscopy, and microscopy methods. Course highlights the use of synchrotrons in practical experiments. Prerequisites: physics and quantum mechanics/physical chemistry courses for physical science and engineering majors, or by permission of instructor. QR, SC

APHY 458a / PHYS 458a, Principles of Optics with Applications Hui Cao

Introduction to the principles of optics and electromagnetic wave phenomena with applications to microscopy, optical fibers, laser spectroscopy, and nanostructure physics. Topics include propagation of light, reflection and refraction, guiding light, polarization, interference, diffraction, scattering, Fourier optics, and optical coherence. Prerequisite: PHYS 430. QR, SC

*** APHY 469a or b, Special Projects** Daniel Prober

Faculty-supervised individual or small-group projects with emphasis on research (laboratory or theory). Students are expected to consult the director of undergraduate studies and appropriate faculty members to discuss ideas and suggestions for suitable topics. This course may be taken more than once, is graded pass/fail, is limited to Applied Physics majors, and does not count toward the senior requirement. Permission of the faculty adviser and of the director of undergraduate studies is required.

*** APHY 470b, Statistical Methods with Applications in Science and Finance** Sohrab Ismail-Beigi

Introduction to key methods in statistical physics with examples drawn principally from the sciences (physics, chemistry, astronomy, statistics, biology) as well as added examples from finance. Students learn the fundamentals of Monte Carlo, stochastic

random walks, and analysis of covariance analytically as well as via numerical exercises.

Prerequisites: ENAS 194, MATH 222, and ENAS 130, or equivalents. QR, SC

* **APHY 471a and APHY 472b, Senior Special Projects** Daniel Prober

Faculty-supervised individual or small-group projects with emphasis on research (laboratory or theory). Students are expected to consult the director of undergraduate studies and appropriate faculty members to discuss ideas and suggestions for suitable topics. This course may be taken more than once and is limited to Applied Physics majors in their junior and senior years. Permission of the faculty adviser and of the director of undergraduate studies is required.

Archaeological Studies

Director of undergraduate studies: Oswaldo Chinchilla
(oswaldo.chinchilla@yale.edu), 51 Hillhouse Ave., 436-5923, archaeology.yale.edu

This interdisciplinary major is supervised by the University's Council on Archaeological Studies. Inquiries about the major may be addressed to the chair of the council, Richard Burger, Department of Anthropology, 10 Schem St., or to the director of undergraduate studies (DUS).

The major in Archaeological Studies provides a program of interdepartmental offerings covering prehistoric, early historic, medieval, and other cultures and cultural developments in the Old and New Worlds, and introduces students to the analytic tools that facilitate archaeological studies. The major is designed to expose students to a variety of archaeological research perspectives: anthropological, historical, art historical, and scientific. Also emphasized are substantive studies including (1) study of such prehistoric–early historic transformations as the origins of agriculture, cities and states, and early empires, and (2) study of the material culture, art, and architecture of prehistoric, early historic, and medieval cultures, including the iconography of ancient cultures, the relationship between art and society, ancient writing systems, and American historical archaeology.

REQUIREMENTS OF THE MAJOR

The major consists of twelve courses, including the senior project. In addition, students must participate in a Yale-affiliated summer research project, or another archaeological field school approved in advance by the DUS. The following five courses are required: an introductory survey; the introductory laboratory course ARCG 316L; an advanced laboratory course; a theory course; and the senior research project ARCG 491. The remaining seven courses required for the major must be distributed among the subject areas represented by the departments and programs offering courses multiple-titled with Archaeological Studies, with three of those seven courses falling in different departments and programs. The relevant departments and programs are Anthropology, Classics, Environmental Studies, Geology and Geophysics, History, History of Art, Near Eastern Languages and Civilizations, and Religious Studies. Some courses may be applied to categories other than the ones in which they are listed in this bulletin upon approval by the DUS. For three of the seven archaeology electives students may, with permission of the DUS, substitute courses from other departments in areas related to their research.

Students majoring in Archaeological Studies are strongly encouraged, but are not required, to devote a second summer to archaeological research, either in the field or in a laboratory. Members of the Council faculty currently direct archaeological field projects in China, Egypt, Guatemala, Peru, Mongolia, Senegal, Syria, and Rome. Qualified majors are encouraged to apply for research positions with these projects.

Field research In addition to being the base for several faculty field projects around the globe, the Council on Archaeological Studies takes as its principal mission the encouragement of multiple field experiences. Our undergraduate majors are required to participate in at least one intensive summer field school. Approval is required, and costs are often subsidized by the Council. Students are encouraged to participate in each

other's field projects, thereby learning about the greatest number of cultures and areas possible, while experiencing a diverse array of field situations.

SENIOR REQUIREMENT

The final requirement for the major is a senior research project (ARCG 491) in some field of archaeology, preferably one involving more than one area or discipline.

ADVISING

Students majoring in Archaeological Studies should consult with the DUS at the beginning of each term.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 12 term courses (incl senior project)

Specific course required ARCG 316L

Distribution of courses 1 intro survey; 1 advanced lab; 1 theory course; 7 electives, at least 1 in each of 3 areas, as specified

Field requirement 1 summer field techniques course or research project, as specified and approved by the DUS

Substitution permitted For 3 electives, 3 courses related to research, with DUS permission

Senior requirement Research project (ARCG 491)

COUNCIL ON ARCHAEOLOGICAL STUDIES

Anthropology Richard Burger (*Chair*), Oswaldo Chinchilla, Ellery Frahm, William Honeychurch, Roderick McIntosh, Eric Sargis, Anne Underhill, David Watts

Classics Andrew Johnston, Diana Kleiner

Geology & Geophysics Ronald Smith

History Joseph Manning

History of Art Edward Cooke, Jr., Milette Gaifman, Mary Miller

Near Eastern Languages & Civilizations John Darnell, Karen Foster, Eckart Frahm, Harvey Weiss

Religious Studies Stephen Davis

Anthropology

* **ARCG 031b / CLCV 059b / EVST 030b / HIST 020b / NELC 026b, Rivers and Civilization** Harvey Weiss

The appearance of the earliest cities along the Nile and Euphrates in the fourth millennium B.C. Settlements along the rivers, the origins of agriculture, the production and extraction of agricultural surpluses, and the generation of class structures and political hierarchies. How and why these processes occurred along the banks of these rivers; consequent societal collapses and their relation to abrupt climate changes.

Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU, SO

ARCG 171a / ANTH 171a, Great Civilizations of the Ancient World Staff

A survey of selected prehistoric and historical cultures through examination of archaeological sites and materials. Emphasis on the methodological and theoretical

approaches by which archaeologists recover, analyze, and interpret the material remains of the past. SO

ARCG 172b / ANTH 172b, Great Hoaxes and Fantasies in Archaeology William Honeychurch

Examination of selected archaeological hoaxes, cult theories, and fantasies; demonstration of how archaeology can be manipulated to authenticate nationalistic ideologies, religious causes, and modern stereotypes. Examples of hoaxes and fantasies include the lost continent of Atlantis, Piltdown man, ancient giants roaming the earth, and alien encounters. Evaluation of how, as a social science, archaeology is capable of rejecting such interpretations about the past. SO

ARCG 215b / ANTH 215b, Archaeology of China Anne Underhill

Archaeology of China, one of the world's oldest and most enduring civilizations, from the era of early humans to early empires. Methods of interpreting remains from prehistoric and historic period sites. SO

*** ARCG 253b / ANTH 253b, Introduction to Experimental Archaeology** Roderick McIntosh and Ellery Frahm

Experimental archaeology is one of the most important tools to develop and test models which link human behaviors and natural forces to the archaeological record. This class explores the elements of good experimental design and procedures. ANTH 316L, ARCG 316L recommended. SO

ARCG 264b / ANTH 264b / SPAN 404b, Aztec Archaeology and Ethnohistory Oswaldo Chinchilla Mazariegos

An anthropological and ethnohistorical examination of the Aztec civilization that dominated much of Mexico from the fourteenth century until the Spanish Conquest of 1521. SO

ARCG 272b / AFST 272b / ANTH 272b, African Prehistory Jessica Thompson and Roderick McIntosh

Survey of archaeological evidence for the original contributions of the African continent to the human condition. The unresolved issues of African prehistory, from the time of the first hominids, through development of food production and metallurgy, to the rise of states and cities. SO

ARCG 316La / ANTH 316La, Introduction to Archaeological Laboratory Sciences Ellery Frahm and Roderick McIntosh

Introduction to techniques of archaeological laboratory analysis, with quantitative data styles and statistics appropriate to each. Topics include dating of artifacts, sourcing of ancient materials, remote sensing, and microscopic and biochemical analysis. Specific techniques covered vary from year to year.

*** ARCG 385b / ANTH 385b, Archaeological Ceramics** Anne Underhill

Archaeological methods for analyzing and interpreting ceramics, arguably the most common type of object found in ancient sites. Focus on what different aspects of ceramic vessels reveal about the people who made them and used them. SO

*** ARCG 417a / ANTH 417a, Maya Hieroglyphic Writing** Oswaldo Chinchilla Mazariegos

Introduction to the ancient Maya writing system. Contents of the extant corpus, including nametags, royal and ritual commemorations, dynastic and political subjects,

and religious and augural subjects; principles and methods of decipherment; overview of the Maya calendar; comparison with related writing systems in Mesoamerica and elsewhere in the ancient world. SO

*** ARCG 450a / ANTH 450a, Analysis of Lithic Technology** Staff

Introduction to the analysis of chipped and ground stone tools, including instruction in manufacturing chipped stone tools from obsidian. Review of the development of stone tool technology from earliest tools to those of historical periods; relevance of this technology to subsistence, craft specialization, and trade. Discussion of the recording, analysis, and drawing of artifacts, and of related studies such as sourcing and use-wear analysis. SO

ARCG 464b / ANTH 464b / E&EB 464b, Human Osteology Eric Sargis

A lecture and laboratory course focusing on the characteristics of the human skeleton and its use in studies of functional morphology, paleodemography, and paleopathology. Laboratories familiarize students with skeletal parts; lectures focus on the nature of bone tissue, its biomechanical modification, sexing, aging, and interpretation of lesions. SC, SO

*** ARCG 482b / ANTH 482b, Advanced Archaeological Theory** Roderick McIntosh

Review of the intellectual history of archaeology, with readings from the Enlightenment to the present. Emphasis on the tension between science, mysticism, and nationalism in the interpretation of prehistoric processes. SO RP

Classics

ARCG 170a / CLCV 170a / HSAR 250a, Roman Art: Empire, Identity, and Society

Diana Kleiner

Masterpieces of Roman art from the Republic to Constantine studied in their historical and social contexts. The great Romans and the monuments they commissioned—portraits, triumphal arches, columns, and historical reliefs. The concept of empire and imperial identity, politics and portraiture, the making and unmaking of history through art, and the art of women, children, freedmen, and slaves. HU

ARCG 243b / CLCV 160b / HSAR 243b, Greek Art and Architecture Milette Gaifman

Monuments of Greek art and architecture from the late Geometric period (c. 760 B.C.) to Alexander the Great (c. 323 B.C.). Emphasis on social and historical contexts. HU

ARCG 252b / CLCV 175b / HSAR 252b, Roman Architecture Diana Kleiner

The great buildings and engineering marvels of Rome and its empire. Study of city planning and individual monuments and their decoration, including mural painting. Emphasis on developments in Rome, Pompeii, and central Italy; survey of architecture in the provinces. HU

*** ARCG 424b / CLCV 230b / HSAR 424b, eClavdia: Women in Ancient Rome** Diana Kleiner

The contributions of Roman women to one of the greatest cities—and one of the greatest empires—in world history. Lost stories of real-life Roman women recovered from public and residential buildings, portraits, paintings, and other works of Roman art and architecture. HU RP

Environmental Studies

ARCG 226b / EVST 226b / NELC 268b, Global Environmental History Harvey Weiss

The dynamic relationship between environmental and social forces from the Pleistocene glaciations to the Anthropocene present. Pleistocene extinctions; transition from hunting and gathering to agriculture; origins of cities, states, and civilization; adaptations and collapses of Old and New World civilizations in the face of climate disasters; the destruction and reconstruction of the New World by the Old. Focus on issues of adaptation, resilience, and sustainability, including forces that caused long-term societal change. SO

Geology and Geophysics

* **ARCG 362b / EVST 362b / G&G 362b, Observing Earth from Space** Ronald Smith

A practical introduction to satellite image analysis of Earth's surface. Topics include the spectrum of electromagnetic radiation, satellite-borne radiometers, data transmission and storage, computer image analysis, the merging of satellite imagery with GIS and applications to weather and climate, oceanography, surficial geology, ecology and epidemiology, forestry, agriculture, archaeology, and watershed management. Prerequisites: college-level physics or chemistry, two courses in geology and natural science of the environment or equivalents, and computer literacy. QR, SC

History of Art

ARCG 110b / HSAR 110b, Introduction to the History of Art: Global Decorative Arts

Edward Cooke

Global history of the decorative arts from antiquity to the present. The materials and techniques of ceramics, textiles, metals, furniture, and glass. Consideration of forms, imagery, decoration, and workmanship. Themes linking geography and time, such as trade and exchange, simulation, identity, and symbolic value. HU

Near Eastern Languages and Civilizations

* **NELC 001b / AFST 001b / ARCG 001b, Egypt and Northeast Africa: A Multidisciplinary Approach** John Darnell

An introduction to Egyptology, examining approximately 10,000 years of Nile Valley cultural records and 3,000 years of Egyptian history. The course presents an overview of the historical and archaeological study of Egypt and her southern neighbor Nubia. Various original written and visual sources are used, including the collections of the Peabody Museum and the Yale Art Gallery, with some material accessible in the classroom. Students gain a basic understanding of the hieroglyphic script and the Ancient Egyptian language, and are able to read some inscriptions in museum visits at the end of the course. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

* **ARCG 128a / AFST 128a / EGYPT 128a / RLST 251a, Magic and Ritual in Ancient Egypt** John Darnell

Introduction to ancient Egyptian magic and rituals with an overview on the use of magic and discussion of the different rituals and festivals attested in Ancient Egypt.

HU

ARCG 244a / NELC 109a / RLST 245a, The Age of Akhenaton John Darnell
 Study of the period of the Egyptian pharaoh Akhenaton (reigned 1353–1336 B.C.E.), often termed the Amarna Revolution, from historical, literary, religious, artistic, and archaeological perspectives. Consideration of the wider Egyptian, ancient Near Eastern, African, and Mediterranean contexts. Examination of the international diplomacy, solar theology, and artistic developments of the period. Reading of primary source material in translation. HU

Advanced Research

*** ARCG 471a or b and ARCG 472a or b, Directed Reading and Research in Archaeology** Staff

Qualified students may pursue special reading or research under the guidance of an instructor. A written statement of the proposed research must be submitted to the director of undergraduate studies for approval.

*** ARCG 491a or b, Senior Research Project in Archaeology** Staff

Required of all students majoring in Archaeological Studies. Supervised investigation of some archaeological topic in depth. The course requirement is a long essay to be submitted as the student's senior essay. The student should present a prospectus and bibliography to the director of undergraduate studies no later than the third week of the term. Written approval from the faculty member who will direct the reading and writing for the course must accompany the prospectus.

Architecture

Director of undergraduate studies: Bimal Mendis (bimal.mendis@yale.edu), 328 RDH, 432-8325; architecture.yale.edu

Architecture is a humanistic endeavor. The purpose of the undergraduate major is to include the study of architecture within a comprehensive liberal arts education, drawing from the broader academic and professional environment of the Yale School of Architecture. The curriculum includes work in design; in history, theory, and criticism of architecture; and in urbanism (urban studies), and leads to a bachelor of arts degree with a major in Architecture. As a liberal arts major in Yale College, it is not an accredited professional degree program. For accredited professional degree programs, refer to the requirements of the National Architectural Accrediting Board (NAAB).

INTRODUCTORY COURSES FOR NONMAJORS AND MAJORS

Introductory courses are ARCH 150, 200, and 280. They are open to all Yale College students and are required for those interested in the Architecture major prior to application. Interested students may also consider courses such as ARCH 260, 262, 312, or STCY 176.

PREREQUISITES

Three courses are prerequisite for all concentrations: ARCH 150, 200, and 280.

REQUIREMENTS OF THE MAJOR

Students majoring in Architecture are required to take fifteen course credits, including prerequisites and the senior requirement. Majors are expected to take the three prerequisites by the end of their sophomore year and to complete a core of four courses, for five course credits, by the end of their junior year. They must also base their studies in one of three areas of concentration: Design; History, Theory, and Criticism; or Urbanism (Urban Studies). (For the Class of 2022 and subsequent classes the Urban Studies concentration will be called Urbanism). Majors are also required to complete three orientation sessions: digital media orientation, library orientation, and shop orientation. Within the concentrations, electives are categorized under four broad subject areas: history and theory of architecture; urbanism and landscape; materials and design; and structures and computation.

Design concentration The Design concentration explores the role of architecture in shaping the world around us. It introduces complex processes involved in solving spatial and programmatic problems. Creative work is grounded in the study of history and culture, and in the analysis of social conditions influencing architecture. Design studios provide a forum for production and discourse. Studio projects address issues of architectural form, space, composition, site, tectonics, and programs within broader humanistic ideals.

For the Design concentration, the following additional courses are required:

1. A core of four courses: the studio courses ARCH 250 and 251 taken during the junior year after the student is accepted into the major; and the history of architecture surveys ARCH 260, and 262 or 312, to be completed by the end of the junior year

2. One elective in history and theory of architecture chosen from ARCH 341, 348, 431, or other relevant course in History of Art approved by the DUS
3. One elective in urbanism and landscape chosen from ARCH 344, 345, 347, 348, 385, STCY 176, or other relevant course in American Studies; Ethics, Politics, and Economics; Environmental Studies; or Political Science approved by the director of undergraduate studies (DUS)
4. One elective in materials and design chosen from ARCH 162 or another relevant course in Environmental Studies approved by the DUS
5. One elective in structures and computation chosen from ARCH 161, an approved calculus or physics course, or other relevant course approved by the DUS. (Elementary calculus is strongly recommended as preparation for graduate studies in architecture.)
6. The senior requirement, ARCH 450 and 494

History, Theory, and Criticism concentration The History, Theory, and Criticism concentration is intended to establish a broad historical and intellectual framework for the study of architecture. An interdisciplinary approach is encouraged through additional courses taken in various fields of humanities and social sciences. Normally these interdisciplinary courses address subjects closely linked to architectural history, theory, and criticism. Such courses may include archaeology, history of religion, aesthetics, philosophy, or visual culture. Permission of the DUS is required if the courses fall outside the specified course of studies. During their senior year students complete a written senior essay on a topic approved by the faculty.

For the History, Theory, and Criticism concentration, the following additional courses are required:

1. A core of four courses: the urban laboratory, ARCH 360 taken during the fall term of junior year; ARCH 362 or an elective taken during the spring term of junior year; and the history of architecture surveys ARCH 260, and 262 or 312 to be completed by the end of junior year
2. Four electives in history and theory of architecture, chosen from ARCH 341, 348, 431, or other relevant courses in History of Art approved by the DUS
3. One elective in urbanism and landscape chosen from ARCH 344, 345, 347, 348, 385, STCY 176, or other relevant course in American Studies; Ethics, Politics, and Economics; Environmental Studies; or Political Science approved by the DUS
4. The senior requirement ARCH 490 and 491

Urbanism (Urban Studies) concentration For the Class of 2022 and subsequent classes the Urban Studies concentration will be called Urbanism. The Urbanism (Urban Studies) concentration encourages a broad, interdisciplinary investigation of the complex forces that shape the urban physical environment. The sequence of courses culminates in a senior essay that builds on course work, and either develops analysis and planning proposals for a specific site or furthers an individual research agenda.

For the Urbanism (Urban Studies) concentration, the following additional courses are required:

1. A core of four courses: ARCH 360 and 362 taken during the junior year; and ARCH 341 and 345, to be completed by the end of the junior year

2. Four electives in urbanism and landscape chosen from ARCH 344, 345, 347, 348, 385, STCY 176, or other relevant courses in American Studies; Ethics, Politics, and Economics; Environmental Studies; or Political Science approved by the DUS
3. One elective in history and theory of architecture chosen from ARCH 341, 348, 431, or other relevant course in History of Art approved by the DUS
4. The senior requirement, ARCH 490 and 491

Digital media orientation All Architecture students are required to complete orientation sessions in digital media workshop and materials laboratory. Students enrolled in ARCH 200 are required to complete these sessions at the beginning of the spring term of the sophomore year. Access to digital media equipment will not be allowed until the required orientation sessions have been completed. Questions should be addressed to the DUS or the manager of digital media, Vincent Guerrero (vincent.guerrero@yale.edu), 432-7552.

Library orientation The Architecture program requires all students to complete a ninety-minute introductory library research session. Students enrolled in ARCH 200 must take this session at the beginning of the spring term of the sophomore year. Failure to complete the required orientation will preclude completion of the major. Students may offer no substitutions for this orientation. Students should register with the Haas Family Arts Library Public Services Librarian, Lindsay King (lindsay.king@yale.edu), 436-8052. Questions should be addressed to the DUS.

Shop orientation The Architecture program requires all majors to complete several woodshop and materials lab orientation sessions. Students who are enrolled in ARCH 200, and who are interested in using the shop, must take these sessions during the first weeks of the spring term of the sophomore year. Access to the woodshop and materials lab will not be allowed until the required orientation sessions have been completed. Questions should be addressed to the DUS or to the shop coordinator, Timothy Newton (timothy.newton@yale.edu), 432-7234.

SENIOR REQUIREMENT

Seniors in the Design track take ARCH 450 in the fall term and 494 in the spring term. Seniors in the History, Theory, and Criticism track and in the Urbanism (Urban Studies) track take ARCH 490 in the fall term and 491 in the spring term. Proposals for senior projects and essays are submitted in the fall term for review and approval by the senior project coordinator; they are then distributed to faculty members for review. Upon successful review, students may ask faculty members to act as senior advisers. Senior essays and projects for ARCH 491 are due in the office of the DUS by April 10, 2020. Design projects for ARCH 494 are due as specified by the course instructor. All seniors must submit a portfolio of their work to the office of the DUS by May 1, 2020. For all architecture majors, this portfolio must be representative of the student's design work including prerequisites and the senior project. History, Theory, and Criticism majors and Urbanism (Urban Studies) majors must also include a copy of the senior essay and other appropriate texts.

ADVISING AND DECLARATION OF INTENT TO MAJOR

Yale College students interested in the Architecture major must submit a Declaration of Intent to Major during the spring term of their sophomore year, after taking ARCH 150, 200, and 280. The Declaration of Intent to Major must be submitted to the office of the

DUS no later than 4 p.m. on March 27, 2020, in 328 Rudolph (third floor), and must include the following information: name, address, telephone number, courses related to architecture already taken, and a statement of purpose. Students should also indicate their desired concentration at this time. Additionally, by May 1, 2020 students must submit an electronic portfolio representative of coursework for ARCH 150, 200, and a paper from ARCH 280. Upon the successful completion of these requirements, students are notified in writing regarding their acceptance to the major by May 31, 2020.

Courses in the School of Architecture Unless otherwise indicated in the course descriptions, all courses in the School of Architecture are open to majors and nonmajors with permission of the instructor and the graduate registrar. They are not available for the Credit/D/Fail option. Students are admitted on the basis of their previous course work and previous performance.

REQUIREMENTS OF THE MAJOR

Prerequisites ARCH 150, 200, and 280

Number of courses 15 course credits (incl prereqs and senior req)

Specific courses required *Design* – ARCH 250, 251; 260; and 262 or 312; *History, Theory, and Criticism* – ARCH 360; 362 or elective; ARCH 260; and 262 or 312; *Urbanism (Urban Studies)* – ARCH 360, 362; 341, 345

Distribution of courses *Design* – 1 elective in history and theory of arch, 1 in urbanism and landscape, 1 in materials and design, 1 in structures and computation, all approved by DUS; *History, Theory, and Criticism* – 4 electives in history and theory of arch, 1 in urbanism and landscape, all approved by DUS; *Urbanism (Urban Studies)* – 4 electives in urbanism and landscape, 1 in history and theory of arch, all approved by DUS

Other Orientation sessions in digital media, library, and shop

Senior requirement *All concentrations* – portfolio representative of design work, including prereqs and senior req; *Design* – ARCH 450 and 494; *History, Theory, and Criticism* and *Urbanism (Urban Studies)* – ARCH 490 and 491

MEMBERS OF THE SCHOOL OF ARCHITECTURE TEACHING IN YALE COLLEGE

Professors Turner Brooks (*Adjunct*), Keller Easterling, Alexander Garvin (*Adjunct*), Steven Harris (*Adjunct*), Alan Plattus, Alexander Purves (*Emeritus*)

Associate Professor Eeva-Liisa Pelkonen

Assistant Professors Sunil Bald (*Adjunct*), Jesse LeCavalier (*Visiting*), Bimal Mendis (*Adjunct*), Kyoung Sun Moon, Elihu Rubin

Lecturers Victor Agran, Erleen Hatfield

Critics Marta Justo Caldeira, Katherine Davies, Kyle Dugdale, Andrei Harwell, Adam Hopfner, Joyce Hsiang, Timothy Newton

Courses

* **ARCH 006a, Architectures of Urbanism: Thinking, Seeing, Writing the City**
Michael Schlabs

What is architecture, and how is it conceived, relative to notions of the urban – to the broader, deeper, messier web of ideas, forms, and fantasies constituting “the city?”

Can architecture play a role in defining the city, as such, or does the city's political and social construction place it outside the scope of specifically architectural concerns? Likewise, what role can the city play in establishing, interrogating, and extrapolating the limits of architecture, whether as a practice, a discourse, or a physical manifestation of human endeavor in the material environment? This course addresses these and other related questions, seeking to position architecture in its broader urban, social, cultural, political, intellectual, and aesthetic contexts. In so doing, it assumes the position that the nature and character of the urban can largely be characterized in terms of the manner in which we, as a society, conceive, construct, and contribute to notions of “the public,” or “the common.” Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. Prerequisite: general knowledge of 20th-century history. HU

ARCH 150a, Introduction to Architecture Alexander Purves

Lectures and readings in the language of architecture. Architectural vocabulary, elements, functions, and ideals. Notebooks and projects required. Not open to freshmen. Required for all Architecture majors. HU

* **ARCH 154b, Drawing Architecture** Victor Agran

Introduction to the visual and analytical skills necessary to communicate architectural ideas. Observation and documentation of architectural space on the Yale campus. Drawing exercises introduce the conventions of architectural representation: plan, section, elevation, and isometric drawings, as well as freehand perceptual drawings of architectural space. Open to first and second year students.

* **ARCH 161a, Introduction to Structures** Erleen Hatfield

Basic principles governing the behavior of building structures. Developments in structural form combined with the study of force systems, laws of statics, and mechanics of materials and members and their application to a variety of structural systems. Prerequisites: trigonometry and some knowledge of calculus. Enrollment limited to 20. QR, SC

* **ARCH 162b, Materials in Architecture** Timothy Newton

Science and technology of basic building materials studied together with historic and current design applications. Skills and processes required to create, shape, and connect materials experienced through hands-on projects. Technical notebooks, drawings, design and build exercises, and projects required. Enrollment limited to 20.

ARCH 200b, Scales of Design Bimal Mendis

Exploration of architecture and urbanism at multiple scales from the human to the world. Consideration of how design influences and shapes the material and conceptual spheres through four distinct subjects: the human, the building, the city, and the world. Examination of the role of architects, as designers, in constructing and shaping the inhabited and urban world. Lectures, readings, reviews and four assignments that address the spatial and visual ramifications of design. Not open to first-year students. Required for all Architecture majors. HU

* **ARCH 230b / STCY 176b, Introduction to the Study of the City** Alexander Garvin

An examination of forces shaping American cities and strategies for dealing with them. Topics include housing, commercial development, parks, zoning, urban renewal, landmark preservation, new towns, and suburbs. The course includes games, simulated problems, fieldwork, lectures, and discussion. SO

*** ARCH 250a, Methods and Form in Architecture I** Katherine Davies

Analysis of architectural design of specific places and structures. Analysis is governed by principles of form in landscape, program, ornament, and space, and includes design methods and techniques. Readings and studio exercises required. Enrollment limited to 25. Open only to Architecture majors. 1½ Course cr

*** ARCH 251b, Methods and Form in Architecture II** Michael Schlabs

Continuation of ARCH 250. Analysis of architectural design of specific places and structures. Analysis is governed by principles of form in landscape, program, ornament, and space, and includes design methods and techniques. Readings and studio exercises required. 1½ Course cr

ARCH 260a / HSAR 326a, History of Architecture I: Antiquity to the Baroque Kyle Dugdale

The first half of a two-term sequence in the history of architecture. Architecture and urbanism from ancient Egypt through Greek and Roman classical traditions to the Enlightenment. The formal expression—organizational, structural, and ornamental—and social context of specific buildings and urban areas. Architecture as a form of social expression that builds on its own stylistic development, articulating a response to changes in history and culture. Emphasis on Western architecture, with selections from other parts of the world. HU

ARCH 280b / AMST 197b / HSAR 219b, American Architecture and Urbanism Elihu Rubin

Introduction to the study of buildings, architects, architectural styles, and urban landscapes, viewed in their economic, political, social, and cultural contexts, from precolonial times to the present. Topics include: public and private investment in the built environment; the history of housing in America; the organization of architectural practice; race, gender, ethnicity and the right to the city; the social and political nature of city building; and the transnational nature of American architecture. HU

ARCH 312b / HSAR 312b, Modern Architecture in a Global Context, 1750-present Craig Buckley

Architects, movements, and buildings central to the development of modern architecture from the mid eighteenth century through to the present. Common threads and differing conceptions of modern architecture around the globe. The relationship of architecture to urban transformation; the formulation of new typologies; architects' responses to new technologies and materials; changes in regimes of representation and media. Architects include Claude Nicolas Ledoux, Giovanni Battista Piranesi, John Soane, Frank Lloyd Wright, Le Corbusier, Ludwig Mies van der Rohe, Lina Bo Bardi, Louis Kahn, and Kenzo Tange. HU

*** ARCH 341b / GLBL 253b / LAST 318b, Globalization Space** Keller Easterling

Infrastructure space as a primary medium of change in global polity. Networks of trade, energy, communication, transportation, spatial products, finance, management, and labor, as well as new strains of political opportunity that reside within their spatial disposition. Case studies include free zones and automated ports around the world, satellite urbanism in South Asia, high-speed rail in Japan and the Middle East, agripoles in southern Spain, fiber optic submarine cable in East Africa, spatial products of tourism in North Korea, and management platforms of the International Organization for Standardization. HU

ARCH 345a, Civic Art: Introduction to Urban Design Alan Plattus

Introduction to the history, analysis, and design of the urban landscape. Principles, processes, and contemporary theories of urban design; relationships between individual buildings, groups of buildings, and their larger physical and cultural contexts. Case studies from New Haven and other world cities. HU

*** ARCH 353a, Urban Field Geography** Elihu Rubin

A methods seminar in urban field geography. Traveling on foot, students engage in on-site study of architecture, urban planning and design, cultural landscapes, and spatial patterns in the city. Learn how to "read" the urban landscape, the intersection of forces that have produced the built environment over time. HU

*** ARCH 360b, Urban Lab: An Urban World** Joyce Hsiang

Understanding the urban environment through methods of research, spatial analysis, and diverse means of representation that address historical, social, political, and environmental issues that consider design at the scale of the entire world. Through timelines, maps, diagrams, collages and film, students frame a unique spatial problem and speculate on urbanization at the global scale. Prerequisites: For non-majors: permission of the instructor is required. For ARCH majors: ARCH 150, 200, and 280. HU 1½ Course cr

*** ARCH 362a, Urban Lab: City Making** Anthony Acciavatti

How architects represent, analyze, construct, and speculate on critical urban conditions as distinct approaches to city making. Investigation of a case study analyzing urban morphologies and the spatial systems of a city through diverse means of representation that address historical, social, political, and environmental issues. Through maps, diagrams, collages and text, students learn to understand spatial problems and project urban interventions. Prerequisites: For non-majors: permission of the instructor is required. For ARCH majors: ARCH 150, 200, and 280. 1½ Course cr

*** ARCH 450a, Senior Studio** Turner Brooks

Advanced problems with emphasis on architectural implications of contemporary cultural issues. The complex relationship among space, materials, and program. Emphasis on the development of representations – drawings and models – that effectively communicate architectural ideas. To be taken before ARCH 494. Enrollment limited to Architecture majors. 1½ Course cr

*** ARCH 471a or b, Individual Tutorial** Bimal Mendis

Special courses may be established with individual members of the department only. The following conditions apply: (1) a prospectus describing the nature of the studio program and the readings to be covered must be approved by both the instructor and the director of undergraduate studies; (2) regular meetings must take place between student and instructor; (3) midterm and final reviews are required. For seniors with DUS approval; meetings by appointment with DUS.

*** ARCH 490a, Senior Research Colloquium** Marta Caldeira

Research and writing colloquium for seniors in the Urban Studies and History, Theory, and Criticism tracks. Under guidance of the instructor and members of the Architecture faculty, students define their research proposals, shape a bibliography, improve research skills, and seek criticism of individual research agendas. Requirements include proposal drafts, comparative case study analyses, presentations to faculty, and the formation of

a visual argument. Guest speakers and class trips to exhibitions, lectures, and special collections encourage use of Yale's resources.

* **ARCH 491b / URBN 491, Senior Project** Marta Caldeira

An essay or project in the student's area of concentration. Students in the history, theory, and criticism track or in the urban studies track pursue independent research with an adviser; this project must terminate in a senior essay.

* **ARCH 494b, Senior Project Design Studio** Steven Harris

Individual design investigations, focusing on independence and precision in the deployment of design ideas. Reliance on visual and nonverbal presentations. Development of a three-dimensional component, such as large-scale mock details, or other visual means of presentation, which might include photography, film, video, or interactive media. Examination of the skills, topics, and preparation to support design research. 1½ Course cr

Art

(Drawing, Filmmaking, Graphic Design, Painting/Printmaking, Photography, and Sculpture)

Director of undergraduate studies: Lisa Kereszi (art.dus@yale.edu), 122 GRN, 432-2600; art.yale.edu/undergraduate

Students in the Art major develop a critical and practical understanding of the visual arts through a studio-based curriculum; apply fundamentals of art across a variety of media and disciplines; relate the practice of making art to the study areas of art history and theory; and gain a high level of mastery of at least one artistic discipline. Students learn to place their own work in the context of the contemporary art world and society, and this study is a crucial element in a liberal arts curriculum for future art practitioners and those working in other fields alike. Students may concentrate on a medium such as painting/printmaking, sculpture, graphic design, photography, or filmmaking, and interdisciplinary study is supported.

COURSES FOR NONMAJORS AND MAJORS

Courses in Art are open to all undergraduate students. In cases where student demand for entry into a course is greater than can be accommodated, priority is given to School of Art students and declared Art majors. The director of undergraduate studies (DUS) and members of the Art faculty will be present for counseling on Tuesday, August 27, 2019, from 10:30 a.m. to 1:30 p.m. adjacent to the School of Art Gallery at Holcombe T. Green Jr. Hall, 1156 Chapel St. Students seeking advice about course selection or the program in Art should come at that time. Others wishing to elect Art courses should go to the first meeting of the class, where each instructor determines the class enrollment. Art classes begin on Wednesday, August 28. For courses beginning in the spring term, counseling will be held on Monday, January 13, 2020, from 12 p.m. to 1:30 p.m. adjacent to the School of Art Gallery at Holcombe T. Green Jr. Hall, 1156 Chapel St.; please note that all art classes begin on Tuesday, January 14, 2020. All Art majors are required to register with the DUS at the beginning of each term at the time and place listed above in order to be enrolled or to continue in the major.

PREREQUISITES

The prerequisites for acceptance into the major are a sophomore review, which is an evaluation of work from studio courses taken at the Yale School of Art, and five introductory (100-level) term courses. Four of the introductory courses must have been completed at the time of the sophomore review. Visual Thinking (ART 111) and Basic Drawing (ART 114) are mandatory. At the time of the review, the student should be enrolled in the fifth 100-level prerequisite course. In exceptional cases, arrangements for a special review during the junior year may be made with the DUS.

REQUIREMENTS OF THE MAJOR

The Art major requires fourteen term courses, including the following: (1) five prerequisite courses at the 100 level (including Basic Drawing and Visual Thinking); (2) four courses at the 200 level or above; (3) the Junior Seminar (ART 395) or Critical Theory in the Studio (ART 301); (4) the two-term senior project (ART 495 and

ART 496); and (5) two term courses in the history of art. Program guidelines and specific requirements for the various areas of concentration are described below.

Areas of concentration Each Art major selects an area of concentration from five possible choices: (1) graphic design, (2) painting/printmaking, (3) photography, (4) sculpture, and (5) filmmaking. Required courses for the *graphic design concentration* include ART 132; ART 264 and 265; ART 368 or ART 369; and ART 468 or 469. The *painting/printmaking concentration* requires ART 116; ART 130 or ART 230 or 231; ART 330 and 331; ART 224 or ART 356; and ART 430. Students in the *photography concentration* take ART 136 and/or ART 138; ART 237; ART 337 or ART 338; ART 379; and ART 401. The *sculpture concentration* requires ART 110; ART 120 or 121; ART 345 and 346; and ART 445. Required courses for the *filmmaking concentration* include ART 241 and 142; ART 341; ART 342; and ART 442 or 443. Students in the filmmaking concentration may substitute courses in film and media studies for the history of art requirement.

Credit/D/Fail Courses taken Credit/D/Fail may be counted toward the requirements of the major.

SENIOR REQUIREMENT

The senior requirement consists of a two-term senior project, ART 495 and ART 496.

UNIQUE TO THE MAJOR

Summer fellowship Art majors are eligible to apply for the Ellen Battell Stoeckel Fellowship for study at the Yale University Summer School of Music and Art in Norfolk, Connecticut. Applicants for the program must be officially classified as junior Art majors and be returning to Yale for two terms of their senior year. The program awards up to four course credits for work successfully completed. These credits cannot be used toward the requirements of the Art major; however, they may be counted toward the 36-course-credit graduation requirement.

Repeated and outside courses Some Art courses may be repeated for credit, with permission of both the instructor and the DUS. Course credits in studio art earned at other institutions may, in some cases, be applied toward the requirements of the major, but not to replace the two prereqs, at the discretion of the DUS and subject to a faculty review process.

Facilities fees All Art majors are charged a facilities access and user fee of \$200 per term. Additional lab/materials fees are levied in individual courses, as specified at the end of the course description. Lab/materials fees cannot be refunded after the second week of classes.

REQUIREMENTS OF THE MAJOR

Prerequisites Favorable faculty review of work done in studio courses before end of sophomore year; ART 111 and 114; 3 addtl 100-level courses

Number of courses 14 term courses (incl prereqs and yearlong senior project)

Specific course required *All concentrations*—ART 395 or 301; *Graphic design*—ART 132, 264, 265, 368 or 369, 468 or 469; *Painting/printmaking*—ART 116, 130 or 230 or 231, 330, 331, 224 or 356, 430; *Photography*—ART 136 and/or 138, 237, 337 or 338, 379, 401; *Sculpture*—ART 110, 120 or 121, 345, 346, 445; *Filmmaking*—ART 241, 142, 341, 342, 442 or 443

Distribution of courses 4 courses at 200 level or above; 2 courses in hist of art

Senior requirement Two-term senior project (ART 495, ART 496)

Substitution permitted *Filmmaking concentration* – 2 courses in film & media studies may be substituted for the hist of art req

MEMBERS OF THE SCHOOL OF ART TEACHING IN YALE COLLEGE

Professors Anoka Faruqee, Samuel Messer (*Adjunct*), Robert Storr

Senior Critics Julian Bittiner, Alice Chung, Johannes DeYoung, John Gambell, Barbara Glauber, Jessica Helfand, Pamela Hovland, Christopher Pullman, Douglass Scott, Henk van Assen

Critics Mark Aronson, Yaju Choi, Benjamin Donaldson, Lisa Kereszi, Sandra Luckow, Richard Rose, Laurel Schwulst, Sarah Stevens-Morling, Scott Stowell, Jonathan Weinberg

Lecturers Jonathan Andrews, Sandra Burns, Brent Howard, Sophy Naess, Ted Partin, Elizabeth Tubergen, Alex Valentine, Anahita Vossoughi, Molly Zuckerman-Hartung

Unless otherwise indicated, fall-term classes in Art begin on Wednesday, August 28, 2019 and spring-term classes in Art begin on Tuesday, January 14, 2020.

Introductory Courses

* **ART 004a, Words and Pictures** Halsey Rodman

Introduction to visual narration, the combination of words and pictures to tell a story. Narrative point of view, counternarrative and counterculture, visual satire, personal history, depictions of space and time, and strategies and politics of representation. Sources include illuminated manuscripts, biblical paintings, picture-stories, comic strips, and graphic novels. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU RP

* **ART 006a, Art of the Printed Word** Richard Rose

Introduction to the art and historical development of letterpress printing and to the evolution of private presses. Survey of hand printing; practical study of press operations using antique platen presses and the cylinder proof press. Material qualities of printed matter, connections between content and typographic form, and word/image relationships. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

* **ART 007b, Art of the Game** Sarah Stevens-Morling

Introduction to interactive narrative through video game programming, computer animation, and virtual filmmaking. Topics include interactive storytelling, video game development and modification, animation, and virtual film production. Students produce a variety of works including web-based interactive narratives, collaboratively built video games, and short game-animated film production (*machinima*). Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program.

* **ART 012b, On Activism: The Visual Representation of Protest and Disruption**

Pamela Hovland

An introduction to the visual representations of protest, struggle, and revolution in this country from the Vietnam War to the present moment. The course explores a

range of historically significant social and political movements, visual (communication) and dissemination strategies, and working methods. The primary goal of this studio-based course is to investigate and expand the designer/artist's ability to express a point of view, transform contemporary understanding of local and national issues through a series of exercises, iterative making and experiments in distribution methods via solo and collaborative work. The students' practice is supported by close readings, independent research, case studies, field trips, and presentations from a diverse collection of people directly involved in activism. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

* **ART 013a, Temperamental Spaces** Markus Schinwald

Spaces can sometimes appear as idiosyncratic as the people within them, taking on characteristics we usually ascribe to ourselves. They can appear erratic, comforting, uncanny—even threatening. Working like a therapy session for architecture, the body, and the objects around us, this seminar analyzes a diverse collection of readings and works, ranging from Renaissance mysticism to conceptual art and film, to explore how the visual arts have utilized a productive, but skeptical, relationship with space. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

* **ART 014b, Research in the Making** Karin Schneider

Artistic research expands the research form to focus on haptic and tactile study of physical and historical objects. Through field trips to various special collections and libraries, including the Beinecke, the Yale Art Gallery, and the Map Collection, students respond to specific objects in the vast resources of Yale University. Group discussions, lectures, and critiques throughout the term help foster individual projects. Each student conducts research through the artistic mediums of drawing, photography, video, and audio, to slowly build an interconnected collection of research that is also an artwork. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

* **ART 110b, Sculpture Basics** Sandra Burns

Concepts of space, form, weight, mass, and design in sculpture are explored and applied through basic techniques of construction and material, including gluing and fastening, mass/weight distribution, hanging/mounting, and surface/finishing. Hands-on application of sculptural techniques and review of sculptural ideas, from sculpture as a unified object to sculpture as a fragmentary process. The shops and classroom studio are available during days and evenings throughout the week. Materials fee: \$150. Enrollment limited to 12. Recommended to be taken before ART 120–125. HU RP

* **ART 111a or b, Visual Thinking** Staff

An introduction to the language of visual expression, using studio projects to explore the fundamental principles of visual art. Students acquire a working knowledge of visual syntax applicable to the study of art history, popular culture, and art. Projects address all four major concentrations (graphic design, printing/printmaking, photography, and sculpture). Materials fee: \$25. No prior drawing experience necessary. Open to all undergraduates. Required for Art majors. HU RP

*** ART 114a or b, Basic Drawing** Staff

An introduction to drawing, emphasizing articulation of space and pictorial syntax. Class work is based on observational study. Assigned projects address fundamental technical and conceptual problems suggested by historical and recent artistic practice. No prior drawing experience required. Materials fee: \$25. Open to all undergraduates. Required for Art majors. HU RP

*** ART 116a, Color Practice** Halsey Rodman

Study of the interactions of color, ranging from fundamental problem solving to individually initiated expression. The collage process is used for most class assignments. Materials fee: \$75. HU RP

ART 120a, Introduction to Sculpture: Wood Elizabeth Tubergen

Introduction to wood and woodworking technology through the use of hand tools and woodworking machines. The construction of singular objects; strategies for installing those objects in order to heighten the aesthetic properties of each work. How an object works in space and how space works upon an object. Materials fee: \$75.00. Prerequisite: ART 110. HU

ART 121b, Introduction to Sculpture: Metal Brent Howard

Introduction to working with metal through examination of the framework of cultural and architectural forms. Focus on the comprehensive application of construction in relation to concept. Instruction in welding and general metal fabrication. Ways in which the meaning of work derives from materials and the form those materials take. Materials fee: \$75.00. Prerequisite: ART 110. HU

*** ART 130a or b, Painting Basics** Staff

A broad formal introduction to basic painting issues, including the study of composition, value, color, and pictorial space. Emphasis on observational study. Course work introduces students to technical and historical issues central to the language of painting. Materials fee: \$75. Recommended for non-majors and art majors. HU RP

*** ART 132a or b, Introduction to Graphic Design** Staff

A studio introduction to visual communication, with emphasis on the visual organization of design elements as a means to transmit meaning and values. Topics include shape, color, visual hierarchy, word-image relationships, and typography. Development of a verbal and visual vocabulary to discuss and critique the designed world. Materials fee: \$150. HU RP

*** ART 136a or b, Black & White Photography Capturing Light** Staff

An introductory course in black-and-white photography concentrating on the use of 35mm cameras. Topics include the lensless techniques of photograms and pinhole photography; fundamental printing procedures; and the principles of film exposure and development. Assignments encourage the variety of picture-forms that 35mm cameras can uniquely generate. Student work is discussed in regular critiques. Readings examine the invention of photography and the flâneur tradition of small-camera photography as exemplified in the work of artists such as Henri Cartier-Bresson, Helen Levitt, Robert Frank, and Garry Winogrand. Materials fee: \$150. HU RP

*** ART 138a or b, Digital Photography Seeing in Color** Theodore Partin

The focus of this class is the digital making of still color photographs with particular emphasis on the potential meaning of images in a overly photo-saturated world. Through picture-making, students develop a personal visual syntax using color for

effect, meaning, and psychology. Students produce original work using a required digital SLR camera. Introduction to a range of tools including color correction, layers, making selections, and fine inkjet printing. Assignments include regular critiques with active participation and a final project. Materials fee: \$150. HU RP

* **ART 142a / FILM 162a, Introductory Documentary Filmmaking** Sandra Luckow
The art and craft of documentary filmmaking. Basic technological and creative tools for capturing and editing moving images. The processes of research, planning, interviewing, writing, and gathering of visual elements to tell a compelling story with integrity and responsibility toward the subject. The creation of nonfiction narratives. Issues include creative discipline, ethical questions, space, the recreation of time, and how to represent "the truth." Materials fee: \$150. RP

* **ART 145b, Introduction to Digital Video** Neil Goldberg
Introduction to the formal principles and basic tools of digital video production. Experimental techniques taught alongside traditional HD camera operation and sound capture, using the Adobe production suite for editing and manipulation. Individual and collaborative assignments explore the visual language and conceptual framework for digital video. Emphasis on the spatial and visual aspects of the medium rather than the narrative. Screenings from video art, experimental film, and traditional cinema. Materials fee: \$150. RP

ART 185b, Principles of Animation Staff
The physics of movement in animated moving-image production. Focus on historical and theoretical developments in animation of the twentieth and twenty-first centuries as frameworks for the production of animated film and visual art. Classical animation and digital stop-motion; fundamental principles of animation and their relation to traditional and digital technologies. Materials fee: \$150. RP

Intermediate Courses

[ART 210, Sculpture as Object]

* **ART 224b, Figure Drawing** Troy Michie
A study of the human figure, using a range of approaches. Emphasis on observation, anatomy, and spatial structure. Historical examples from cave painting to contemporary art. Materials fee: \$75 per term. ART 114 or equivalent. RP

* **ART 235b / THST 235b, Dance Theater** Irene Hultman Monti
A studio-based introduction to movement vocabularies, physical techniques, and choreographic repertoire from post-1950 modern and postmodern dance theater to the present. Through a historical survey of major aesthetic shifts in dance, the course focuses on building the essential skills of a dance artist: the heightened awareness of time and space, the ability to read and translate diverse choreographic ideas, and the ability to question in motion. Open to students of all levels and majors. HU

* **ART 237a, Intermediate Black & White Photography Visual Voice** Lisa Kereszi
A class in black-and-white photography extending the concerns of ART 136 in which students learn to define and refine their own particular photographic voice through regular critiques. Introduction to the use of loaned medium-format cameras. Specialized topics include long-exposure photography, the use of flash, and intermediate-level printing techniques, including an increase in scale. Survey of the rich tradition of higher-resolution analog photography and the production of artists such as

Brassai, Diane Arbus, Lee Friedlander, Carrie Mae Weems and Robert Adams as well as contemporary new voices. Pre req: Art 136 or 138. Materials fee: \$150. Prerequisite: ART 136 or equivalent. HU RP

* **ART 241b / FILM 161b, Introductory Film Writing and Directing** Sandra Luckow
Problems and aesthetics of film studied in practice as well as in theory. In addition to exploring movement, image, montage, point of view, and narrative structure, students photograph and edit their own short videotapes. Emphasis on the writing and production of short dramatic scenes. Priority to majors in Art and in Film & Media Studies. Materials fee: \$150. Prerequisite for all majors: ART 142; additional prerequisite for Film & Media Studies majors: FILM 150. RP

* **ART 264a or b, Typography!** Alice Chung
An intermediate graphic-design course in the fundamentals of typography, with emphasis on ways in which typographic form and visual arrangement create and support content. Focus on designing and making books, employing handwork, and computer technology. Typographic history and theory discussed in relation to course projects. Materials fee: \$150. Prerequisite: ART 132. RP

* **ART 265b, Typography: Expression, Structure, and Sequence** Henk Van Assen
Continued studies in typography, incorporating more advanced and complex problems. Exploration of grid structures, sequentiality, and typographic translation, particularly in the design of contemporary books, and screen-based kinetic typography. Relevant issues of design history and theory discussed in conjunction with studio assignments. Materials fee: \$150. Prerequisite: ART 264. RP

* **ART 301b, Critical Theory in and Out of the Studio** Jonathan Weinberg
Key concepts in modern critical theory as they aid in the analysis of creative work in the studio. Psychoanalysis, Marxism, feminism, structuralism, and poststructuralism examined in relation to modern and contemporary movements in the visual arts, including cubism, surrealism, Arte Povera, pop, minimalism, conceptual art, performance art, the Pictures group, and the current relational aesthetics movement. Materials fee: \$25. HU RP

* **ART 331b, Intermediate Painting** Sophia Naess
Further exploration of concepts and techniques in painting, emphasizing the individuation of students' pictorial language. Various approaches to representational and abstract painting. Studio work is complemented by in-depth discussion of issues in historical and contemporary painting. Materials fee: \$150 per term. Prerequisite: ART 130, 230, 231, or permission of instructor. RP

ART 332a, Painting Time Sophia Naess
Painting techniques paired with conceptual ideas that explore how painting holds time both metaphorically and within the process of creating a work. Use of different Yale locations as subjects for observational on-site paintings. Materials fee: \$75. Prerequisite: ART 130, 230, or 231, or with permission of instructor. HU RP

* **ART 338b, Contemporary Problems in Color with Digital Photography** Theodore Partin
How do you make a contemporary portrait? What is an effective portrait? What makes a portrait today? Can one be made through observation? Is consent required? This class confronts these questions, among others, while addressing the often uneasy relationship between photographer and sitter. Using digital capture with an emphasis

on color photography students produce original work in portraiture by committing to a regular and rigorous photographic practice. Range of tools addressed include working with RAW files, masks, compositing and grayscale, and medium and large-scale color inkjet printing. Students produce original work for critique, with special attention to ways in which their technical decisions can clarify their artistic intentions in representing a person. Materials fee: \$150. Prerequisite: ART 138 or permission of the instructor. RP

ART 341b / FILM 355b, Intermediate Film Writing and Directing Jonathan Andrews
In the first half of the term, students write three-scene short films and learn the tools and techniques of staging, lighting, and capturing and editing the dramatic scene. In the second half of the term, students work collaboratively to produce their films. Focus on using the tools of cinema to tell meaningful dramatic stories. Materials fee: \$150. Enrollment limited to 8. Priority to majors in Art and in Film & Media Studies. Prerequisites: ART 241. RP

ART 342a / FILM 356a, Intermediate Documentary Filmmaking Sandra Luckow
Students explore the storytelling potential of the film medium by making documentary art. The class concentrates on finding and capturing intriguing, complex scenarios in the world and then adapting them to the film form. Questions of truth, objectivity, style, and the filmmaker's ethics are considered using examples of students' work. Exercises in storytelling principles. Materials fee: \$150. Limited enrollment. Priority to majors in Art and in Film & Media Studies. Prerequisites: ART 141 or 142, and FILM 150. HU RP

* **ART 348a, Body, Space, and Time** Staff
Exploration of time-based art mediums such as moving-image work, performance, sound, and installation, with emphasis on the integration and manipulation of different mediums and materials. Ways in which the history of time-based works informs contemporary practice. Individual studio projects as well as workshops in the use of various processes, practices, and techniques. Materials fee: \$75. Enrollment limited to 12. Prerequisite: ART 122 or permission of instructor. HU RP

[**ART 355, Silkscreen Printing**]

ART 356a, Printmaking I Alexander Valentine
An introduction to intaglio (dry point and etching), relief (woodcut), and screen printing (stencil), as well as to the digital equivalents of each technique, including photo screen printing, laser etching, and CNC milling. How the analog and digital techniques inform the outcome of the printed image, and ways in which they can be combined to create more complex narratives. Materials fee: \$150. Prerequisite: ART 114 or equivalent. RP

[**ART 359, Lithography**]

* **ART 368a, Graphic Design Methodologies** Pamela Hovland
Various ways that design functions; how visual communication takes form and is recognized by an audience. Core issues inherent in design: word and image, structure, and sequence. Analysis and refinement of an individual design methodology. Attention to systematic procedures, techniques, and modes of inquiry that lead to a particular result. Materials fee: \$150. Prerequisites: ART 132 and 264, or permission of instructor. RP

*** ART 369b, Interactive Design and the Internet** Staff

In this studio course, students create work within the web browser to explore where the internet comes from, where it is today, and where it's going—recognizing that there is no singular history, present, or future, but many happening in parallel. The course in particular focuses on the internet's impact on art—and vice versa—and how technological advance often coincides with artistic development. Students will learn foundational, front-end languages HTML, CSS, and JavaScript in order to develop unique graphic forms for the web that are considered alongside navigation, pacing, and adapting to variable screen sizes and devices. Open to Art majors. No prior programming experience required. Materials fee: \$150. Prerequisite: ART 132 or permission of instructor. RP

ART 370a, Motion Design Christopher Pullman

A studio class that explores how the graphic designer's conventions of print typography and the dynamics of word-image relationship change with the introduction of time, motion, and sound. Projects focus on the controlled interaction of words and images to express an idea or tell a story. The extra dimensions of time-based communications; choreography of aural and visual images through selection, editing, and juxtaposition. Materials fee: \$150. ART 265; ART 368 recommended. RP

ART 371b / MUSI 370b, Sound Art Martin Kersels

Introduction to sound art, a contemporary artistic practice that uses sound and listening as mediums, often creating psychological or physiological reactions as part of the finished artwork. The history of sound art in relation to the larger history of art and music; theoretical underpinnings and practical production; central debates and problems in contemporary sound art. Includes creation and in-class critique of experimental works. Materials fee: \$25. HU

*** ART 379b, Form For Content With the View Camera** Benjamin Donaldson

A course for experienced photography students to become more deeply involved with the important technical and aesthetic aspects of the medium, including a concentrated study of operations and conceptual thinking required in the use of loaned analog view cameras, added lighting and advanced printing techniques. Scanning and archival printing of negatives are included. Student work is discussed in regular rigorous critiques. Review of significant historic photographic traditions is covered. Students are encouraged to employ any previous digital training although this class is primarily analog. Prerequisite: Art 237 or permission of the instructor. Materials fee: \$150. Prerequisite: ART 237 or permission of instructor. RP

ART 388a, Edging Temporality: Screen, Picture, Image A.L. Steiner

Screen-based works—film, video, television, projection and computer technologies—embody heuristic techniques that formulate, propagate, and disseminate experience, information, and knowledge to viewers. The screen, picture, and image are interdependent components of moving-image production—at once, intra-active, interactive, interdependent, and interwoven. This course analyzes and implements the practical application of screen content production, while exploring the tangible, fungible, and palpable intermix of *affect* and *effect* of these two-dimensional surfactants. Working within the terms of Susan Sontag's proposal of an '*ecology of images*,' as outlined in her 1977 seminal work *On Photography*, we experiment within an environment in which producers are repatriated as *actants-in-presentia*. Analysis and diagnosis of our moving image-laden condition strives towards an understanding of

where we are, and perhaps, where we are to go. Prerequisite: ART 138, 142 or 145, or permission of the instructor.

*** ART 389a / THST 395a, Postmodern Dance** Emily Coates

A studio-based exploration of the epochal shift in choreographic aesthetics known as postmodern dance. The social and historical context in which postmodern dance emerged, including the reconstruction of key dances from the 1960s and 1970s; the evolution of postmodern dance aesthetics into the twenty-first century. HU

*** ART 395a, Junior Seminar** Jonathan Weinberg

Ongoing visual projects addressed in relation to historical and contemporary issues. Readings, slide presentations, critiques by School of Art faculty, and gallery and museum visits. Critiques address all four areas of study in the Art major. Prerequisite: at least four courses in Art. HU RP

Advanced Courses

[ART 430, Advanced Painting Studio]

ART 432a / ART 434, Painting Studio: The Narrative Figure Staff

A course for intermediate and advanced painting students exploring historical and contemporary issues in figurative painting including portraiture, narrative and history painting. Studio work is complemented by an in-depth study of the gaze, subjectivity, memory, and imagination. After guided assignments, ultimate emphasis will be on self-directed projects. May be taken more than once. Materials fee: \$75 per term. Prerequisites: ART 230 and one course from ART 331, 332, or 342, or with permission of instructor. HU RP

ART 433b, Painting Studio: Space and Abstraction Molly Zuckerman-Hartung

A course for intermediate and advanced painting students, exploring historical and contemporary issues in abstract painting including geometric, optical, material, and gestural abstraction. Studio work is complemented by in-depth study of flatness, depth, color, authorship and expression. After guided assignments, ultimate emphasis will be on self-directed projects. May be taken more than once. Materials fee: \$75 per term. Prerequisites: ART 230 and one course from ART 331, 332, or 342, or with permission of instructor. HU RP

*** ART 442a and ART 443b / FILM 483a and FILM 484b, Advanced Film Writing and Directing** Jonathan Andrews

A yearlong workshop designed primarily for majors in Art and in Film & Media Studies making senior projects. Each student writes and directs a short fiction film. The first term focuses on the screenplay, production schedule, storyboards, casting, budget, and locations. In the second term students rehearse, shoot, edit, and screen the film. Materials fee: \$150. Enrollment limited to 8. Priority to majors in Art and in Film & Media Studies. Prerequisite: ART 341.

*** ART 457b, Interdisciplinary Printmaking** Alexander Valentine

An in-depth examination of planographic techniques, including screen printing, lithography, and digital pigment printing. Relationships to more dimensional forms of printing such as collography, embossment, vacuum bag molding, and 3D printing. Creation of editions as well as unique objects, focusing on both individual techniques

and creating hybrid forms. Materials fee: \$150. Recommended for Art majors to be taken concurrently with ART 324 or 433. at least one term of printmaking. RP

ART 468a or b, Advanced Graphic Design: Series and Systems Staff

A probe into questions such as how an artist can be present as an idiosyncratic individual in his or her work, and how that work can still communicate on its own to a broad audience. Concentration on making graffiti, i.e., the design of a set of outdoor marks and tours for New Haven. A technological component is included, both in the metaphor of designing outdoor interaction as a way to learn about screen-based interaction and in the final project to design an interface for a handheld computer. Materials fee: \$150 per term. Prerequisites: ART 264 or 265, and 367 or 368, or permission of instructor. RP

*** ART 495a, Senior Project I** Lisa Kereszi

A project of creative work formulated and executed by the student under the supervision of an adviser designated in accordance with the direction of the student's interest. Proposals for senior projects are submitted on the appropriate form to the School of Art Undergraduate Studies Committee (USC) for review and approval at the end of the term preceding the last resident term. Projects are reviewed and graded by an interdisciplinary faculty committee made up of members of the School of Art faculty. An exhibition of selected work done in the project is expected of each student. RP

*** ART 496b, Senior Project II** Lisa Kereszi

A project of creative work formulated and executed by the student under the supervision of an adviser designated in accordance with the direction of the student's interest. Proposals for senior projects are submitted on the appropriate form to the School of Art Undergraduate Studies Committee (USC) for review and approval at the end of the term preceding the last resident term. Projects are reviewed and graded by an interdisciplinary faculty committee made up of members of the School of Art faculty. An exhibition of selected work done in the project is expected of each student.

Astronomy

Directors of undergraduate studies: Priyamvada Natarjan (Priyamvada.natarjan@yale.edu) [F], STN 216, 436-4833; Greg Laughlin (astro.dus@yale.edu) [Sp] 46 HLH 208, 436-9405; astronomy.yale.edu

Astronomy is a quantitative physical science that applies physics, mathematics, and statistical analysis to observing, describing, and modeling the universe. The undergraduate courses and degree programs offered by the Department of Astronomy train students in research techniques and quantitative reasoning and develop creative problem solvers. Students who complete the major continue on to top-tier graduate programs in astrophysics or related science fields, and they are sought after by employers in a range of fields from health care management to the banking and investment industry. The department offers a B.A. in Astronomy and a B.S. in Astrophysics.

INTRODUCTORY COURSES

Introductory courses with no prerequisites The department offers a variety of courses without prerequisites that provide an introduction to astronomy with particular attention to recent discoveries and theories. Courses numbered below 150 are intended for students who desire a broad, nontechnical introduction to astronomy. These courses fulfill the science distributional requirement, and some also fulfill the quantitative reasoning distributional requirement.

Courses with numbers from 150 to 199 are topical rather than survey courses. Most of these offerings fulfill both the science and the quantitative reasoning requirements. ASTR 155 is a laboratory course that provides a hands-on introduction to astronomical observing. ASTR 160 and 170 provide an introduction to frontier topics in modern astrophysics and cosmology.

Introductory courses with high school calculus and physics prerequisites Students who have taken calculus and physics in high school may enroll in quantitative introductory courses. ASTR 210 and ASTR 220 focus on fundamental measurements and tools used in astronomy and include an in-depth study of stellar astrophysics (ASTR 210) or galaxies and cosmology (ASTR 220). These courses overlap in content, so students should take either ASTR 210 or 220 but not both. ASTR 255 provides training in data analysis and research techniques, including computer programming and numerical and statistical analysis.

PREREQUISITES

B.A. degree program The prerequisites for the B.A. degree are PHYS 170 and 171, or 180 and 181, or 200 and 201, and MATH 112 and 115.

B.S. degree program Prerequisites for the B.S. degree include an introductory physics sequence (PHYS 180 and 181, or 200 and 201, or 260 and 261); a physics laboratory sequence (PHYS 165L and 166L, or 205L and 206L); and the mathematics sequence MATH 112, 115, and either MATH 120 or ENAS 151. ASTR 155 may be substituted for one term of the physics laboratory sequence. All prerequisites should be completed by the end of the sophomore year.

Prerequisites for advanced electives Courses numbered 300 and above are more specialized and intensive. The prerequisites for these courses include ASTR 210 or 220, multivariable calculus, and two terms of introductory college physics.

REQUIREMENTS OF THE MAJOR

B.A. degree program The B.A. degree program in Astronomy is designed for students who do not plan to continue in a graduate program in astronomy, but who are interested in the subject as a basis for a liberal arts education or as a physical science background to careers such as medicine, teaching, journalism, business, law, or government. It allows greater flexibility in course selection than the B.S. program because the emphasis is on breadth of knowledge rather than on specialization.

Ten courses are required beyond these prerequisites, including either ASTR 210 or 220, ASTR 255, 310, one additional Astronomy elective numbered 150 or above, and the senior requirement (ASTR 492). Two of the ten courses must be advanced courses in mathematics, such as MATH 120 or ENAS 151, or courses in mathematical methods, including statistics or computer science, such as CPSC 112, MATH 200 or above, or ASTR 356. Three electives can be drawn from any of the natural, applied, or mathematical sciences (including additional astronomy courses); at least two of these must be advanced enough to have college-level prerequisites.

B.S. degree program The B.S. degree program in Astrophysics is designed to provide a strong foundation in astrophysics for students interested in graduate study or a career in astronomy, physics, or a related science.

Beyond the prerequisites, twelve term courses are required in astronomy, physics, and mathematics. Students complete at least six courses in astronomy, including either ASTR 210 or 220, 255, 310, 320, and a two-term senior project (ASTR 490 and 491). Students also complete three physics courses numbered 400 or above, normally PHYS 401, 402, and 439. In addition, majors choose either one additional 400-level course in physics or an astronomy elective numbered 300 or higher. In mathematics, students complete a course in differential equations selected from MATH 246, PHYS 301, or ENAS 194, and either an additional mathematics course numbered 200 or above or a course in statistics or computing such as CPSC 112, 201, or ASTR 356.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the requirements of either degree program.

SENIOR REQUIREMENT

B.A. degree program The senior requirement consists of a senior essay or independent research project carried out for one term in ASTR 492 under the supervision of a faculty member.

B.S. degree program The senior requirement consists of an independent research project in astronomy carried out for two terms in ASTR 490 and 491 under the supervision of a faculty member.

ADVISING

Before entering the junior year, students must obtain approval of a course of study from the director of undergraduate studies (DUS).

Graduate work Graduate courses in astronomy are open to qualified undergraduates who already have a strong preparation in mathematics, physics, and astronomy. Students wishing to take a graduate course must first obtain the permission of the instructor and of the director of graduate studies.

REQUIREMENTS OF THE MAJOR

ASTRONOMY, B.A.

Prerequisites PHYS 170, 171, or 180, 181, or 200, 201; MATH 112, 115

Number of courses 10 courses beyond prereqs, incl senior req

Specific courses required ASTR 210 or 220; ASTR 255, 310

Distribution of courses 1 astronomy elective numbered 150 or above; 2 advanced math courses; 3 science electives (may include addtl astronomy courses), at least 2 with college-level prereqs

Senior requirement Senior essay or senior research project (ASTR 492)

ASTROPHYSICS, B.S.

Prerequisites PHYS 180, 181, or 200, 201, or 260, 261; PHYS 165L, 166L, or 205L, 206L; MATH 112, 115; MATH 120 or ENAS 151

Number of courses 12 courses beyond prereqs, incl senior req

Specific courses required ASTR 210 or 220; 255, 310, 320

Distribution of courses 3 courses in physics numbered 400 or above; 1 addtl upper-level course in astronomy or physics; 2 courses in math or mathematical methods, as specified

Substitution permitted ASTR 155 for 1 term of physics lab prereq

Senior requirement Senior independent research project (ASTR 490 and 491)

FACULTY OF THE DEPARTMENT OF ASTRONOMY

Professors Charles Bailyn, †Charles Baltay, Sarbani Basu (*Chair*), Paolo Coppi, Pierre Demarque (*Emeritus*), Debra Fischer, Marla Geha, Jeffrey Kenney, Richard Larson (*Emeritus*), Gregory Laughlin, Priyamvada Natarajan, †C. Megan Urry, William van Altena (*Emeritus*), Pieter van Dokkum, Robert Zinn

Associate Professors Hector Arce, †Daisuke Nagai, †Nikhil Padmanabhan, Frank van den Bosch

Lecturer Michael Faison

†A joint appointment with primary affiliation in another department.

Courses

* **ASTR 040a / PHYS 040a, Expanding Ideas of Time and Space** C. Megan Urry
Discussions on the nature of time and space. Topics include the shape and contents of the universe, special and general relativity, dark and light matter, and dark energy. Observations and ideas fundamental to astronomers' current model of an expanding and accelerating four-dimensional universe. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SC

ASTR 110a, Planets and Stars Michael Faison

An introduction to stars and planetary systems. Topics include the solar system and extrasolar planets, planet and stellar formation, and the evolution of stars from birth to death. No prerequisite other than a working knowledge of elementary algebra. QR, SC

ASTR 120b, Galaxies and the Universe Michael Faison

An introduction to stars and stellar evolution; the structure and evolution of the Milky Way galaxy and other galaxies; quasars, active galactic nuclei, and supermassive black holes; cosmology and the expanding universe. No prerequisite other than a working knowledge of elementary algebra. QR, SC

ASTR 130b, Origins and the Search for Life in the Universe Debra Fischer

Origins of the universe, stars, and planets; evolution of conditions that were conducive to the emergence of life on Earth; leading theories for the origin of life; the discovery of exoplanets; comparison of Earth's solar system with other systems that have been discovered; the possibility of habitable conditions where life might have arisen on other worlds; methods of searching for life elsewhere. No prerequisite other than a working knowledge of elementary algebra. SC

[ASTR 135, Archaeoastronomy]**ASTR 155a, Introduction to Astronomical Observing** Michael Faison

A hands-on introduction to the techniques of astronomical observing. Observations of planets, stars, and galaxies using on-campus facilities and remote observing with Yale's research telescopes. Use of electronic detectors and computer-aided data processing. Evening laboratory hours required. One previous college-level science laboratory or astronomy course recommended. SC ½ Course cr

ASTR 170b, Introduction to Cosmology Priyamvada Natarajan

An introduction to modern cosmological theories and observations. Topics include aspects of special and general relativity; curved space-time; the Big Bang; inflation; primordial element synthesis; the cosmic microwave background; the formation of galaxies; and large-scale structure. Prerequisite: a strong background in high school mathematics and physics. QR, SC

ASTR 180a, Introduction to Relativity Charles Bailyn

Introduction to the theories of special and general relativity, and to relativistic astrophysics. Topics include time dilation and length contraction; mass-energy equivalence; space-time curvature; black holes; wormholes; pulsars; quasars; gravitational waves; Hawking radiation. For students not majoring in the physical sciences; some previous acquaintance with high-school physics and/or calculus may be helpful, but is not required. QR, SC

ASTR 210a, Stars and Their Evolution Sarbani Basu

Foundations of astrophysics, focusing on an intensive introduction to stars. Nuclear processes and element production, stellar evolution, stellar deaths and supernova explosions, and stellar remnants including white dwarfs, neutron stars, and black holes. A close look at our nearest star, the sun. How extrasolar planets are studied; the results of such studies. Prerequisite: a strong background in high school calculus and physics. May not be taken after ASTR 220. QR, SC

[ASTR 220, Galaxies and Cosmology]**ASTR 255a / PHYS 295a, Research Methods in Astrophysics** Marla Geha

The acquisition and analysis of astrophysical data, including the design and use of ground- and space-based telescopes, computational manipulation of digitized images and spectra, and confrontation of data with theoretical models. Examples taken from current research at Yale and elsewhere. Use of the Python programming language. A

background in high school calculus and physics. No previous programming experience required. QR, SC RP

ASTR 310a, Galactic and Extragalactic Astronomy Jeffrey Kenney

Structure of the Milky Way galaxy and other galaxies; stellar populations and star clusters in galaxies; gas and star formation in galaxies; the evolution of galaxies; galaxies and their large-scale environment; galaxy mergers and interactions; supermassive black holes and active galactic nuclei. Prerequisites: MATH 115, PHYS 201, and ASTR 210 or 220, or equivalents, or with permission of instructor. QR, SC

ASTR 320b, Physical Processes in Astronomy Franciscus van den Bosch

Introduction to the physics required for understanding current astronomical problems. Topics include basic equations of stellar structure, stellar and cosmic nucleosynthesis, radiative transfer, gas dynamics, and stellar dynamics. Numerical methods for solving these equations. Prerequisites: MATH 120 and PHYS 201 or equivalents, or permission of instructor. Previous experience with computer programming recommended. Taught in alternate years. QR, SC

ASTR 343b / PHYS 343b, Gravity, Astrophysics, and Cosmology Daisuke Nagai

Introduction to frontier areas of research in astrophysics and cosmology exploring ideas and methods. In-depth discussion of the physics underlying several recent discoveries including extrasolar planets – their discovery, properties, and issues of habitability; black holes – prediction of their properties from GR, observational signatures, and detection; and the accelerating universe – introduction to cosmological models and the discovery of dark energy. Prerequisites: PHYS 170, 171, or 180, 181, or 200, 201, or 260, 261, or permission of instructor. QR, SC

ASTR 355a, Observational Astronomy Pieter Van Dokkum

Optics for astronomers. Design and use of optical telescopes, photometers, spectrographs, and detectors for astronomical observations. Introduction to error analysis, concepts of signal-to-noise, and the reduction and analysis of photometric and spectroscopic observations. Prerequisite: one astronomy course numbered above 200, or permission of instructor. Previous experience with computer programming recommended. QR, SC RP

*** ASTR 356b / ASTR 556b / PHYS 356b, Astrostatistics and Data Mining** Hector Arce

Introduction to the statistical tools used to analyze and interpret astrophysical data, including common data mining techniques for finding patterns in large data sets and data-based prediction methods. Use of publicly available high-quality astronomical data from large surveys such as SDSS and 2MASS, and from space-based observatories such as Spitzer, Herschel, and WISE. Coding with the Python programming language. Prerequisite: ASTR 255 or equivalent. QR, SC

[ASTR 360, Interstellar Matter and Star Formation]

*** ASTR 375b, Exoplanets** Gregory Laughlin

Planet formation, exoplanet detection techniques, and the modeling of observations of exoplanet atmospheres. Solar system architecture compared with other planetary systems. From an Earth-centric perspective, habitability factors of rocky planets and the implications for life elsewhere. Prerequisites: MATH 120 and PHYS 201 or equivalents, and one astronomy course numbered above 200. QR, SC

ASTR 380b, Stellar Populations Robert Zinn

The stellar populations of our galaxy and galaxies of the Local Group. Topics include the properties of stars and star clusters, stellar evolution, and the structure and evolution of our galaxy. Prerequisites: PHYS 201 and MATH 120, and one astronomy course numbered above 200. Taught in alternate years. QR, SC RP

ASTR 385a, Introduction to Radio Astronomy Hector Arce

Introduction to the theory and techniques of radio astronomy, including radio emission mechanisms, propagation effects, antenna theory, interferometry, and spectroscopy. Discussion of specific sources such as Jupiter, radio stars, molecular clouds, radio galaxies, ETI, and the microwave background. Includes observational exercises with a small radio telescope. Prerequisites: MATH 120 and PHYS 201 or equivalents. QR, SC

ASTR 418b, Stellar Dynamics Marla Geha

The dynamics and evolution of star clusters; structure and dynamics of our galaxy; theories of spiral structure; dynamical evolution of galaxies. Prerequisites: PHYS 201 and MATH 246 or equivalents; ASTR 310. Taught in alternate years. QR, SC RP

ASTR 420a, Computational Methods for Astrophysics Paolo Coppi

The analytic, numerical, and computational tools necessary for effective research in astrophysics and related disciplines. Topics include numerical solutions to differential equations, spectral methods, and Monte Carlo simulations. Applications to common astrophysical problems including fluids and N-body simulations. Prerequisites: ASTR 320, MATH 120, 222 or 225, and 246. QR RP

ASTR 430b, Galaxies Jeffrey Kenney

A survey of the contents, structure, kinematics, dynamics, and evolution of galaxies; galaxy interactions and the environments of galaxies; properties of active galactic nuclei. Prerequisites: PHYS 201 and MATH 120, and one astronomy course numbered above 200. Taught in alternate years. QR, SC RP

[ASTR 450, Stellar Astrophysics]**[ASTR 465, The Evolving Universe]**

* **ASTR 471a and ASTR 472b, Independent Project in Astronomy** Gregory Laughlin
Independent project supervised by a member of the department with whom the student meets regularly. The project must be approved by the instructor and by the director of undergraduate studies; the student is required to submit a complete written report on the project at the end of the term.

* **ASTR 490a and ASTR 491b, The Two-Term Senior Project** Gregory Laughlin
A two-term independent research project to fulfill the senior requirement for the B.S. degree. The project must be supervised by a member of the department and approved by the director of undergraduate studies.

* **ASTR 492a or b, The One-Term Senior Project** Gregory Laughlin
A one-term independent research project or essay to fulfill the senior requirement for the B.A. degree. The project must be supervised by a member of the department and approved by the director of undergraduate studies.

Biology

Program coordinators: Samantha Lin (samantha.lin@yale.edu) and Julie Park (julie.park@yale.edu)

Yale offers four different biological science majors: Ecology and Evolutionary Biology (E&EB); Molecular Biophysics and Biochemistry (MB&B); Molecular, Cellular, and Developmental Biology (MCDB); and Neuroscience (NSCI). The distinctions between these majors reflect the types of biological systems analysis each represents: the analysis of whole organisms, populations, and ecosystems (E&EB); the analysis of life at the molecular level using tools of chemistry and physics (MB&B); the analysis of molecular, cellular, and developmental biology, genetics, neurobiology, and quantitative biology (MCDB); and the analysis of neurons, neural circuits, brains, and behavior, using a wide range of approaches (NSCI).

Altogether, these approaches cover the vast breadth of disciplines in the biological sciences. The courses BIOL 101–104 are designed as entry points to all four programs in the biological sciences. The prerequisites for the four majors are similar, so students need not commit to a specific major in their first year. Students who wish to major in any of the four bioscience tracks (E&EB, MB&B, MCDB, and NSCI) must complete all four modules.

For information on the major requirements, course offerings, and departmental faculty of the biological sciences programs, see Ecology and Evolutionary Biology; Molecular Biophysics and Biochemistry; Molecular, Cellular, and Developmental Biology; and Neuroscience.

Courses

BIOL 101a or b, Biochemistry and Biophysics Staff

The study of life at the molecular level. Topics include the three-dimensional structures and function of large biological molecules, the human genome, and the design of antiviral drugs to treat HIV/AIDS. The first of four modules in a yearlong foundational biology sequence; meets for the first half of the term. SC ½ Course cr

BIOL 102a or b, Principles of Cell Biology Staff

The study of cell biology and membrane physiology. Topics include organization and functional properties of biological membranes, membrane physiology and signaling, rough endoplasmic reticulum and synthesis of membrane/secretory membrane proteins, endocytosis, the cytoskeleton, and cell division. The second of four modules in a yearlong foundational biology sequence; meets for the second half of the term. Prerequisite: BIOL 101. SC ½ Course cr

BIOL 103a or b, Genetics and Development Staff

Foundation principles for the study of genetics and developmental biology. How genes control development and disease; Mendel's rules; examples of organ physiology. The third of four modules in a yearlong foundational biology sequence; meets for the first half of the term. Prerequisites: BIOL 101 and 102. SC ½ Course cr

BIOL 104a or b, Principles of Ecology and Evolutionary Biology Staff

The study of evolutionary biology, animal behavior, and the history of life. Evolutionary transitions and natural selection. Adaptation at genic, chromosomal,

cellular, organismal, and supra-organismal levels. Distributional and social consequences of particular suites of organismal adaptations. The fourth of four modules in a yearlong foundational biology sequence; meets for the second half of the term. Prerequisites: BIOL 101, 102, and 103. SC ½ Course cr

Biomedical Engineering

Director of undergraduate studies: James Duncan (james.duncan@yale.edu), N309 D TAC, 785-2427, 313 MEC, 432-9917; seas.yale.edu/departments/biomedical-engineering

Engineering methods and strategies are used to address biomedical problems ranging from studies of physiological function using images to the development of artificial organs and new biomaterials. The B.S. degree in Biomedical Engineering is designed to provide students with an understanding of common fundamental methodologies and the ability to develop quantitative approaches to one of four biomedical engineering tracks: Bioimaging, Biomechanics and Mechanobiology, Biomolecular Engineering, and Systems Biology. The flexible course structure of the major permits students to bridge basic concepts in the life sciences and traditional areas of engineering, while also gaining a comprehensive understanding of biomedical engineering as a field of study.

PREREQUISITES

The following prerequisites are common to all tracks in the major: BIOL 101 and 102 or a higher-level course in MCDB or MB&B, with the permission of the director of undergraduate studies (DUS); a lecture course in chemistry numbered CHEM 161 or higher; ENAS 194; MATH 115; MATH 120 or ENAS 151; PHYS 180, 181, 205L, and 206L (or 165L and 166L, with DUS permission).

REQUIREMENTS OF THE MAJOR

Students must complete twelve term courses, totaling at least eleven course credits, beyond the prerequisites, including at least three required courses in the chosen track; two terms of a biomedical engineering laboratory (BENG 355L, 356L); BENG 280, a half-credit course taken sophomore year as part of the senior requirement; and the senior requirement (see below). During the first year, students study basic mathematics, chemistry, and biology. By the end of the sophomore year, students should have taken physics, ENAS 194, BENG 249, and BENG 350. In the junior year, students gain a comprehensive grounding in the field through BENG 351, BENG 352, BENG 353, BENG 355L, and BENG 356L. During the junior and senior years students also acquire depth by taking electives in one of the four areas of concentration. One relevant course (e.g. MB&B 300) may be substituted with DUS permission. A senior seminar and a senior project give students practical, detailed information about their chosen area of concentration.

Students in all tracks are required to take the following seven term courses: BENG 249, 280, 350, 351, 352, 353, 355L, and 356L.

Students in the *Bioimaging track* must also take three courses chosen from BENG 404, 406, 410, 444, 445, 475, 476, or 485.

Students in the *Biomechanics and Mechanobiology track* must also take three courses chosen from MENG 185, 280, 361, BENG 404, 406, 410, 434, 453, 455, 456, 457, or 458.

Students in both the *Biomolecular Engineering track and the Systems Biology track* must also take three courses chosen from BENG 404, BENG 410, 411, 434, 435, 463, 464, 465, 467, or MENG 361.

Research Courses Students are permitted, and encouraged, to engage in research before the senior year by enrolling in BENG 471 and/or BENG 472. These courses, offered pass/fail, may be taken more than once for credit, but repeated courses do not count toward the major. See Academic Regulations, section C, Course Credits and Course Loads.

Credit/D/Fail No course taken Credit/D/Fail may count toward the major, including prerequisites.

Roadmap See visual roadmap of the requirements.

SENIOR REQUIREMENT

In their sophomore year, all students must enroll in BENG 280 and in their senior year, all students must enroll in BENG 480; both are half-credit courses. They must also complete a one-term senior project in their final term of enrollment (BENG 474) or a two-term, yearlong project (BENG 473, 474).

ADVISING

Preparation for graduate study The Biomedical Engineering curriculum is excellent preparation for graduate study in engineering, science, and medicine. In some cases, organic chemistry and/or certain biology courses may be substituted for one course in the major after consultation with the DUS.

REQUIREMENTS OF THE MAJOR

Prerequisites BIOL 101 and 102, or higher-level course in MCDB or MB&B with DUS permission; 1 lecture course in chemistry numbered CHEM 161 or higher; ENAS 194; MATH 115; MATH 120 or ENAS 151; PHYS 180, 181, and 205L, 206L (or 165L, 166L with DUS permission)

Number of courses 12 term courses, totaling at least 11 course credits, beyond prerequisites (incl senior req)

Specific courses required *All tracks*—BENG 249, 280, 350, 351, 352, 353, 355L, 356L; *Bioimaging track*—3 from BENG 404, 406, 410, 444, 445, 475, 476, 485; *Biomechanics and Mechanobiology track*—3 from MENG 185, 280, 361, BENG 404, 406, 410, 434, 453, 455, 456, 457, 458; *Biomolecular Engineering track and Systems Biology track*—3 from BENG 404, 410, 411, 434, 435, 463, 464, 465, 467, MENG 361

Distribution of courses 2 term courses in life sciences among prerequisites and required courses (typically BIOL 101/102 and BENG 350)

Substitution permitted Relevant course with DUS permission

Senior requirement BENG 280, a half-credit course taken sophomore year; BENG 480, a half-credit course taken senior year; a one-term senior project in final term of enrollment (BENG 474) or two-term, yearlong senior project (BENG 473 and 474)

FACULTY OF THE DEPARTMENT OF BIOMEDICAL ENGINEERING

Professors Richard Carson, †Nicholas Christakis, †Robin de Graaf, James Duncan, Jay Humphrey, Fahmeed Hyder, Themis Kyriakides, Andre Levchenko, †Evan Morris, †Laura Niklason, †Xenophon Papademetris, Douglas Rothman, Mark Saltzman, †Martin Schwartz, †Frederick Sigworth, †Brian Smith, Lawrence Staib, †Hemant Tagare, †Paul Van Tassel, Steven Zucker

Associate Professors †Joerg Bewersdorf, Stuart Campbell, Tarek Famy, Rong Fan, Anjelica Gonzalez, †Chi Liu, Kathryn Miller-Jensen, †Corey Wilson

Assistant Professors Michael Mak, Michael Murrell, †Steven Tommasini, †Jiangbing Zhou

Lecturers †Liqiong Gui, †Jing Zhou

†A joint appointment with primary affiliation in another department or school.

Courses

* **BENG 205a, Discovery and Design in Biomedical Research** Jay Humphrey
Multi-disciplinary and team-based research approach to the study of clinical dilemma. Focus on an important health care problem, bringing to bear concepts and principles from diverse areas to identify possible solutions. Study of precision regenerative medicine as it involves aspects of bioengineering, materials science, immunobiology, mechanobiology, computational modeling, and experimental design, as well as hands-on fabrication and materials testing (i.e., data collection and analysis). Prerequisites: MATH 115 and MATH 120 or ENAS 151. SC

BENG 249b, Introduction to Biomedical Computation Michael Mak
Computational and mathematical tools used in biomedical engineering for the simulation of biological systems and the analysis of biomedical data. Basics of computational programming in MATLAB; applications to modeling, design, and statistical and data analysis. Prerequisite: MATH 120 or ENAS 151. QR

* **BENG 280a, Sophomore Seminar in Biomedical Engineering** Kathryn Miller-Jensen
Study of past successes and future needs of the multidisciplinary field of biomedical engineering. Areas of focus include: biomolecular engineering, including drug delivery and regenerative medicine; biomechanics, including mechanobiology and multiscale modeling; biomedical imaging and sensing, including image construction and analysis; and systems biology. ½ Course cr

* **BENG 350a / MCDB 310a, Physiological Systems** Mark Saltzman and Stuart Campbell
Regulation and control in biological systems, emphasizing human physiology and principles of feedback. Biomechanical properties of tissues emphasizing the structural basis of physiological control. Conversion of chemical energy into work in light of metabolic control and temperature regulation. Prerequisites: CHEM 165 or 167 (or CHEM 113 or 115), or PHYS 180 and 181; MCDB 120, or BIOL 101 and 102. SC

BENG 351b / CENG 351b, Biotransport and Kinetics Kathryn Miller-Jensen
Creation and critical analysis of models of biological transport and reaction processes. Topics include mass and heat transport, biochemical interactions and reactions, and thermodynamics. Examples from diverse applications, including drug delivery, biomedical imaging, and tissue engineering. Prerequisites: MATH 115, ENAS 194; BIOL 101 and 102; CHEM 161, 163, or 167; BENG 249. QR

BENG 352b, Biomedical Signals and Images James Duncan and Lawrence Staib
Principles and methods used to represent, model, and process signals and images arising from biomedical sources. Topics include continuous and discrete linear systems analysis, Fourier analysis and frequency response, metrics for signal similarity, and

noise filtering. Biomedical examples range from one-dimensional electrical signals in nerves and muscles to two-dimensional images of organs and cells. Prerequisite: MATH 120 or ENAS 151. BENG 249, 350, and ENAS 194 strongly recommended. QR

BENG 353a / PHYS 353a, Introduction to Biomechanics Michael Murrell

An introduction to the biomechanics used in biosolid mechanics, biofluid mechanics, biothermomechanics, and biochemomechanics. Diverse aspects of biomedical engineering, from basic mechanobiology to the design of novel biomaterials, medical devices, and surgical interventions. Prerequisites: PHYS 180, 181, MATH 115, and ENAS 194. QR

*** BENG 355La, Physiological Systems Laboratory** Rong Fan

Introduction to laboratory techniques and tools used in biomedical engineering for physiological measurement. Topics include bioelectric measurement, signal processing, and dialysis. Enrollment limited to majors in Biomedical Engineering, except by permission of the director of undergraduate studies. SC ½ Course cr

*** BENG 356Lb, Biomedical Engineering Laboratory** Tarek Fahmy

Continuation of BENG 355L, introducing laboratory techniques and tools used in biomedical engineering. Topics include image processing, ultrasound, and microscopy. Enrollment limited. SC ½ Course cr

BENG 404b / MENG 404b, Medical Device Design and Innovation Daniel Wiznia and Steven Tommasini

The engineering design, project planning, prototype creation, and fabrication processes for medical devices that improve patient conditions, experiences, and outcomes. Students develop viable solutions and professional-level working prototypes to address clinical needs identified by practicing physicians. Some attention to topics such as intellectual property, the history of medical devices, documentation and reporting, and regulatory affairs.

*** BENG 405b / EVST 415b, Biotechnology and the Developing World** Anjelica Gonzalez

Study of technological advances that have global health applications. Ways in which biotechnology has enhanced quality of life in the developing world. The challenges of implementing relevant technologies in resource-limited environments, including technical, practical, social, and ethical aspects. Prerequisite: MCDB 120, or BIOL 101 and 102.

*** BENG 406b, Medical Software Design** Xenophon Papademetris

Software design and implementation for medical applications, with emphasis on how new ideas can be developed within today's healthcare regulatory environment. This project-based course focuses on the interaction of medical imaging and 3D printing. Topics include the methods and design principles to take 3D medical images, and how to image analysis algorithms to create 3D models to guide diagnosis and interventional procedures or build patient-specific medical devices. Permission of the instructor. Strong programming background in at least one programming language. SC

*** BENG 410a, Physical and Chemical Basis of Bioimaging and Biosensing** Fahmeed Hyder, Douglas Rothman, and Richard Carson

Basic principles and technologies for sensing the chemical, electrical, and structural properties of living tissues and of biological macromolecules. Topics include magnetic resonance spectroscopy, microelectrodes, fluorescent probes, chip-based biosensors, X-

ray and electron tomography, and MRI. Prerequisites: BENG 351 and 352 or permission of instructor. QR, SC

BENG 411b, BioMEMS and Biomedical Microdevices Rong Fan

Principles and applications of micro- and nanotechnologies for biomedicine. Approaches to fabricating micro- and nanostructures. Fluid mechanics, electrokinetics, and molecular transport in microfluidic systems. Integrated biosensors and microTAS for laboratory medicine and point-of-care uses. High-content technologies, including DNA, protein microarrays, and cell-based assays for differential diagnosis and disease stratification. Emerging nanobiotechnology for systems medicine. Prerequisites: CHEM 161, 165, or 167 (or CHEM 112, 114, or 118), and ENAS 194. SC

* **BENG 422a, Engineering and Biophysical Approaches to Cancer** Michael Mak

This course focuses on engineering and biophysical approaches to cancer. The course examines the current state of the art understanding of cancer as a complex disease and the advanced engineering and biophysical methods developed to study and treat this disease. All treatment methods are covered. Basic quantitative and computational backgrounds are required. Prerequisites: BENG 249 or equivalent, MATH 120 or equivalent. QR, SC

BENG 434a, Biomaterials Anjelica Gonzalez

Introduction to the major classes of biomedical materials: ceramics, metals, and polymers. Their structure, properties, and fabrication connected to biological applications, from implants to tissue-engineered devices and drug delivery systems. Prerequisite: CHEM 165 (or CHEM 113 or 115); organic chemistry recommended. SC

* **BENG 435b, Biomaterial-Tissue Interactions** Themis Kyriakides

Study of the interactions between tissues and biomaterials, with an emphasis on the importance of molecular- and cellular-level events in dictating the performance and longevity of clinically relevant devices. Attention to specific areas such as biomaterials for tissue engineering and the importance of stem/progenitor cells, as well as biomaterial-mediated gene and drug delivery. Prerequisites: CHEM 161, 165, or 167 (or CHEM 112, 114, or 118); MCDB 120, or BIOL 101 and 102; or equivalents. SC

BENG 444a, Fundamentals of Medical Imaging Chi Liu, Dana Peters, and Gigi Galiana

Review of basic engineering and physical principles of common medical imaging modalities including X-ray, CT, PET, SPECT, MRI, and echo modalities (ultrasound and optical coherence tomography). Additional focus on clinical applications and cutting-edge technology development. BENG 352 or similar background. QR, SC

BENG 445a / EENG 445a, Biomedical Image Processing and Analysis James Duncan and Lawrence Staib

A study of the basic computational principles related to processing and analysis of biomedical images (e.g., magnetic resonance, computed X-ray tomography, fluorescence microscopy). Basic concepts and techniques related to discrete image representation, multidimensional frequency transforms, image enhancement, motion analysis, image segmentation, and image registration. Prerequisite: BENG 352 or EENG 310 or permission of instructors. Recommended preparation: familiarity with probability theory.

BENG 449b, Biomedical Data Analysis Richard Carson

Study of biological and medical data analysis associated with applications of biomedical engineering. Provides basics of probability and statistics, as well as analytical approaches for determination of quantitative biological parameters from experimental data. Includes substantial programming in MATLAB. Prerequisite: MATH 120 or ENAS 151. After or concurrently with ENAS 194. QR

BENG 455b, Vascular Mechanics Jay Humphrey

Methods of continuum biomechanics used to study diverse vascular conditions and treatments from an engineering perspective. Topics include hypertension, atherosclerosis, aneurysms, vein grafts, and tissue engineered constructs. Emphasis on mechanics driven by advances in vascular mechanobiology. Prerequisite: BENG 353.

QR

*** BENG 456b, Molecular and Cellular Biomechanics** Michael Murrell

The basic mechanical principles at the molecular and cellular level that underlie the major physical behaviors of the cell, from cell division to cell migration. Basic cellular physiology, methodology for studying cell mechanical behaviors, models for understanding the cellular response under mechanical stimulation, and the mechanical impact on cell differentiation and proliferation. Prerequisites: MENG 211 and 280 or equivalents, and experience with MATLAB. Recommended preparation: BENG 353 and MCDB 205. QR, SC

BENG 458b, Multiscale Models of Biomechanical Systems Stuart Campbell

Current methods for simulating biomechanical function across biological scales, from molecules to organ systems of the human body. Theory and numerical methods; case studies exploring recent advances in multiscale biomechanical modeling. Includes computer laboratory sessions that introduce relevant software packages. Prerequisites: BENG 249, 351, and 353, or permission of instructor. QR

BENG 459a / MENG 459a, Neuromuscular Biomechanics Madhusudhan Venkadesan

Mechanics and control of animal movement, including skeletal muscle mechanics, systems-level neural and sensory physiology, elements of feedback control, and optimal control. Deriving equations of motion for multibody mechanical systems that are actuated by muscles or muscle-like motors; incorporating sensory feedback; analyzing system properties such as stability and energetics. Prerequisites: MENG 383 and MATH 222 or equivalents, and familiarity with MATLAB or a similar scientific computing environment. QR RP

BENG 463a, Immunoengineering Tarek Fahmy

Introduction to immunoengineering, a field combining immunology with the physical sciences and engineering. Focus on biophysical principles and biomaterial applications for understanding and engineering immunity against diseases such as cancer, autoimmunity and development of new vaccines. Prerequisite: A basic understanding of biochemistry, biophysics, cell biology; calculus and differential equations. QR, SC

BENG 465b / MB&B 361b / MCDB 361b / NSCI 325b, Modeling Biological Systems II

Damon Clark, Thierry Emonet, and Jonathon Howard

Advanced topics related to dynamical processes in biological systems. Processes by which cells compute, count, tell time, oscillate, and generate spatial patterns. Time-dependent dynamics in regulatory, signal-transduction, and neuronal networks; fluctuations, growth, and form. Comparisons between models and experimental

data. Dynamical models applied to neurons, neural systems, and cellular biophysical processes. Use of MATLAB to create models. Prerequisite: MCDB 330 or equivalent, or a 200-level biology course, or with permission of instructor. QR

BENG 467b, Systems Biology of Cell Signaling Andre Levchenko

Approaches from systems biology to the fundamental processes underlying both the sensory capability of individual cells and cell-to-cell communication in health and disease. Prerequisites: BENG 249 and ENAS 194, or equivalents. QR, SC

* **BENG 471a, Special Projects** James Duncan

Faculty-supervised individual or small-group projects with emphasis on research (laboratory or theory), engineering design, or tutorial study. Students are expected to consult the director of undergraduate studies and appropriate faculty members about ideas and suggestions for suitable topics. This course, offered Pass/Fail, can be taken at any time during a student's career, and may be taken more than once. For the Senior Project, see BENG 473, 474. Permission of both the instructor and the director of undergraduate studies is required.

* **BENG 473a, Senior Project** James Duncan

Faculty-supervised biomedical engineering projects focused on research (laboratory or theory) or engineering design. Students should consult with the director of undergraduate studies and appropriate faculty mentors for suitable projects. BENG 473 is taken during the fall term of the senior year and BENG 474 is taken during the spring term of the senior year. Permission of both the faculty mentor and the director of undergraduate studies is required.

BENG 475a / CPSC 475a / EENG 475a, Computational Vision and Biological Perception Steven Zucker

An overview of computational vision with a biological emphasis. Suitable as an introduction to biological perception for computer science and engineering students, as well as an introduction to computational vision for mathematics, psychology, and physiology students. Prerequisite: CPSC 112 and MATH 120, or with permission of instructor. QR, SC RP

* **BENG 480a, Seminar in Biomedical Engineering** Andre Levchenko

Oral presentations and written reports by students analyzing papers from scientific journals on topics of interest in biomedical engineering, including discussions and advanced seminars from faculty on selected subjects. (For Class of 2020 and beyond this course is worth .5 credit.)

* **BENG 485b, Fundamentals of Neuroimaging** Fahmeed Hyder and Douglas Rothman

The neuroenergetic and neurochemical basis of several dominant neuroimaging methods, including fMRI. Technical aspects of different methods, interpretation of results, and controversies or challenges regarding the application of fMRI and related methods in medicine. WR, SC

British Studies

(Courses at the Paul Mellon Centre in London)

During the spring term, the Yale in London program at the Paul Mellon Centre for Studies in British Art, located in central London, offers four courses in British studies generally including British history, history of art or architecture, literature, and drama. Students take all four courses offered, and courses taught at the Paul Mellon Centre must be taken for a letter grade. Further information is available on the program's website. Inquiries may also be directed to yaleinlondon@yale.edu. The application deadline for spring term 2020 is Friday, October 4, 2019. Students will be notified of acceptance within one month of the application deadline. Inquiries about the summer program, described in The Undergraduate Curriculum, should be directed to the same address. Applications for summer 2020 are due Friday, February 14, 2020.

Chemical Engineering

Director of undergraduate studies: Michael Loewenberg
(michael.loewenberg@yale.edu), 303 ML, 432-4334; seas.yale.edu/departments/chemical-and-environmental-engineering

Energy, the environment, and health care are key challenges facing humanity in the twenty-first century. Chemical engineering is a discipline well placed to confront these challenges. Chemical engineering is rooted in the basic sciences of mathematics, chemistry, physics, and biology; a traditional engineering science core of thermodynamics, transport phenomena, and chemical kinetics; a rigorous design component; and an expanding focus on emerging topics in materials, nanotechnology, and life sciences. The discipline has grown from its petrochemical origins to become central to state-of-the-art technologies in microelectronics, alternative energy, biomedicine, and pharmaceuticals.

The Chemical Engineering program, with two degree programs (see below), is principally focused on basic and engineering sciences and on problem solving. Additional emphasis is on communication, analysis of experiments, and chemical process design. A special feature of the program is the accessibility of laboratory research – most chemical engineering majors participate in faculty-led research projects, often resulting in publication and/or presentation at national meetings.

Chemical engineering graduates find a wide range of professional opportunities in academia, industry, government, business, and the nonprofit sector. Many majors go on to graduate programs in chemical, biomedical, or environmental engineering, or to medical, law, or business schools.

The educational objectives of the Chemical Engineering program are the following. Graduating students will achieve positions of leadership within academia, industry, and government; excel in top graduate programs in chemical, biomedical, environmental, and related engineering fields; excel in top professional schools in fields such as law, medicine, or management; join and rise in the ranks of large and small corporations; become successful entrepreneurs; and practice engineering toward the benefit of humankind.

PREREQUISITES

Students considering a Chemical Engineering major are encouraged to take two terms of chemistry and mathematics during the first year, and to contact the director of undergraduate studies (DUS).

Students in both degree programs (see below) take the following prerequisite courses: MATH 112, 115, and ENAS 151 or MATH 120; CHEM 161 and 165 or CHEM 163 and 167; CHEM 134L and 136L; ENAS 130; PHYS 180, 181. Students with advanced high school preparation may reduce the number of prerequisites by placing out of certain courses.

REQUIREMENTS OF THE MAJOR

All students majoring in Chemical Engineering and Engineering Sciences (Chemical) must follow the requirements listed below as approved by the program's faculty. Two degree programs are offered: a B.S. in Chemical Engineering accredited by the

Engineering Accreditation Commission of ABET, Inc., and a B.S. in Engineering Sciences (Chemical).

B.S. degree program in Chemical Engineering The curriculum for the ABET-accredited B.S. degree in Chemical Engineering requires nineteen courses, totaling eighteen credits, including the senior requirement, CENG 416, and the following courses beyond the prerequisites:

1. Mathematics: ENAS 194
2. Chemistry: CHEM 174 and 175 or CHEM 220 and 221; CHEM 222L and 223L; CHEM 332 and 333
3. Engineering science: MENG 361 and three term courses chosen from engineering electives
4. Chemical engineering: CENG 150 or CENG 210; 300, 301, 315, 411, 412L, 480

B.S. degree program in Engineering Sciences (Chemical) The B.S. degree in Engineering Sciences (Chemical) requires eleven term courses, including the senior requirement, CENG 416, and the following courses beyond the prerequisites, chosen in consultation with the DUS:

1. Mathematics: ENAS 194
2. Chemistry: 3 advanced chemistry courses: *option 1*: CHEM 174 and 175 or CHEM 220 and 221; and CHEM 332; or *option 2*: CHEM 174 or 220; CHEM 332 and 333
3. Engineering science: MENG 361
4. Chemical engineering: CENG 150 or CENG 210; 300, 301, 315, 411

SENIOR REQUIREMENT

B.S. degree program in Chemical Engineering In their senior year students must complete a senior research project in CENG 416.

B.S. degree program in Engineering Sciences (Chemical) In their senior year students must complete a senior research project in CENG 416.

REQUIREMENTS OF THE MAJOR

CHEMICAL ENGINEERING, B.S.

Prerequisites MATH 112, 115, ENAS 151 or MATH 120; CHEM 161 and 165 or CHEM 163 and 167; CHEM 134L and 136L; PHYS 180, 181; ENAS 130

Number of courses 19 courses, totaling 18 credits, beyond prereqs (incl senior req)

Specific courses required ENAS 194; CHEM 174 and 175 or CHEM 220 and 221; CHEM 222L and 223L; CHEM 332, 333; MENG 361; CENG 150 or CENG 210; 300, 301, 315, 411, 412L, 480

Distribution of courses 3 addtl electives in engineering

Senior requirement CENG 416

ENGINEERING SCIENCES (CHEMICAL), B.S.

Prerequisites MATH 112, 115, ENAS 151 or MATH 120; CHEM 161 and 165 or CHEM 163 and 167; CHEM 134L and 136L; PHYS 180, 181; ENAS 130

Number of courses 11 term courses beyond prereqs (incl senior req), chosen in consultation with DUS

Specific courses required ENAS 194; 3 adv chem courses, as specified; MENG 361; CENG 150 or CENG 210; 300, 301, 315, 411

Senior requirement CENG 416

FACULTY OF THE DEPARTMENT OF CHEMICAL AND ENVIRONMENTAL ENGINEERING

Professors Eric Altman, †Paul Anastas, †Michelle Bell, †Ruth Blake, Menachem Elimelech, Gary Haller (*Emeritus*), †Edgar Hertwich, †Edward Kaplan, Jaehong Kim, Michael Loewenberg, †Andrew Miranker, Jordan Peccia, Lisa Pfefferle, Daniel Rosner (*Emeritus*), †Mark Saltzman, †Udo Schwarz, T. Kyle Vanderlick, Paul Van Tassel, Julie Zimmerman

Assistant Professors Drew Gentner, Amir Haji-Akbari, †Shu Hu, Desirée Plata, Mingjiang Zhong

Lecturers †Anikò Bezur, †Paul Whitmore

†A joint appointment with primary affiliation in another department or school.

Courses

* CENG 120b / ENAS 120b / ENVE 120b, Introduction to Environmental Engineering

John Fortner

Introduction to engineering principles related to the environment, with emphasis on causes of problems and technologies for abatement. Topics include air and water pollution, global climate change, hazardous chemical and emerging environmental technologies. Prerequisites: high school calculus and chemistry or CHEM 161, 165 or CHEM 163, 167 (may be taken concurrently) or permission of instructor. QR, SC

CENG 150b, Engineering Improv: An Introduction to Engineering Analysis

Michael Loewenberg

Mathematical modeling is not a scripted procedure. Models are constrained by physical principles, including conservation laws and experimental observations but this does not provide a closed description. There is a lot more art in mathematical modeling than is commonly acknowledged and improvisation plays a significant role. The artistic aspects are important and intellectually engaging because they often lead to a deeper understanding. This course provides a general introduction to engineering analysis and to chemical engineering principles. Material includes the derivation of governing equations from first principles and the analysis of these equations, including underlying assumptions, degrees of freedom, dimensional analysis, scaling arguments, and approximation techniques. The goal of this course is to obtain the necessary skills for improvising mathematical models for a broad range of problems that arise in engineering, science and everyday life. Students from all majors are encouraged to take this course. Prerequisite: MATH 112. QR, SC

CENG 300a, Chemical Engineering Thermodynamics

Kyle Vanderlick

Analysis of equilibrium systems. Topics include energy conservation, entropy, heat engines, Legendre transforms, derived thermodynamic potentials and equilibrium criteria, multicomponent systems, chemical reaction and phase equilibria, systematic derivation of thermodynamic identities, criteria for thermodynamic stability, and introduction to statistical thermodynamics. Prerequisite: MATH 120 or ENAS 151 or permission of instructor. QR, SC RP

CENG 301b, Chemical Kinetics and Chemical Reactors Mingjiang Zhong
Physical-chemical principles and mathematical modeling of chemical reactors. Topics include homogeneous and heterogeneous reaction kinetics, catalytic reactions, systems of coupled reactions, selectivity and yield, chemical reactions with coupled mass transport, nonisothermal systems, and reactor design. Applications from problems in environmental, biomedical, and materials engineering. Prerequisite: ENAS 194 or permission of instructor. QR, SC RP

CENG 315b / ENVE 315b, Transport Phenomena Amir Haji Akbari Balou
Unified treatment of momentum, energy, and chemical species transport including conservation laws, flux relations, and boundary conditions. Topics include convective and diffusive transport, transport with homogeneous and heterogeneous chemical reactions and/or phase change, and interfacial transport phenomena. Emphasis on problem analysis and mathematical modeling, including problem formulation, scaling arguments, analytical methods, approximation techniques, and numerical solutions. Prerequisite: ENAS 194 or permission of instructor. QR, SC RP

CENG 345b / ENAS 345b, Principles and Applications of Interfacial Phenomena Kyle Vanderlick

This course covers the nature and consequences of both flexible and rigid interfaces, such as those associated with liquids and solids respectively. We examine the properties of interfaces as they exist alone, as a collective (e.g., colloids), and also as they interact demonstrably with one another. Examples of the latter include thin films, confined fluids and biological membranes. An integral part of this course is the introduction and application of engineering analysis (e.g., finite element analysis) to calculate and predict behaviors central to technological applications. SC

CENG 351b / BENG 351b, Biotransport and Kinetics Kathryn Miller-Jensen
Creation and critical analysis of models of biological transport and reaction processes. Topics include mass and heat transport, biochemical interactions and reactions, and thermodynamics. Examples from diverse applications, including drug delivery, biomedical imaging, and tissue engineering. Prerequisites: MATH 115, ENAS 194; BIOL 101 and 102; CHEM 161, 163, or 167; BENG 249. QR

CENG 373a / ENVE 373a, Air Pollution Control Jordan Peccia
An overview of air quality problems worldwide with a focus on emissions, chemistry, transport, and other processes that govern dynamic behavior in the atmosphere. Quantitative assessment of the determining factors of air pollution (e.g., transportation and other combustion-related sources, chemical transformations), climate change, photochemical “smog,” pollutant measurement techniques, and air quality management strategies. Prerequisite: ENVE 120. QR, SC RP

* **CENG 377a / ENVE 377a, Water Quality Control** Jaehong Kim
Study of the preparation of water for domestic and other uses and treatment of wastewater for recycling or discharge to the environment. Topics include processes for removal of organics and inorganics, regulation of dissolved oxygen, and techniques such as ion exchange, electro dialysis, reverse osmosis, activated carbon adsorption, and biological methods. Prerequisite: ENVE 120 or permission of instructor. SC RP

CENG 411a, Separation and Purification Processes Paul Van Tassel
Theory and design of separation processes for multicomponent and/or multiphase mixtures via equilibrium and rate phenomena. Topics include single-stage and cascaded

absorption, adsorption, extraction, distillation, partial condensation, filtration, and crystallization processes. Applications to environmental engineering (air and water pollution control), biomedical-chemical engineering (artificial organs, drug purification), food processing, and semiconductor processing. Prerequisite: CENG 300 or 315 or permission of instructor. QR, SC RP

CENG 412Lb / CENG 412, Chemical Engineering Laboratory and Design Lisa Pfefferle

An introduction to design as practiced by chemical and environmental engineers. Engineering fundamentals, laboratory experiments, and design principles are applied toward a contemporary chemical process challenge. Sustainability and economic considerations are emphasized. SC

CENG 416b / ENVE 416b, Chemical Engineering Process Design Yehia Khalil
Study of the techniques for and the design of chemical processes and plants, applying the principles of chemical engineering and economics. Emphasis on flowsheet development and equipment selection, cost estimation and economic analysis, design strategy and optimization, safety and hazards analysis, and environmental and ethical considerations. Enrollment limited to seniors majoring in Chemical Engineering or Environmental Engineering. QR, SC RP

CENG 471a or b, Independent Research Michael Loewenberg

Faculty-supervised individual student research and design projects. Emphasis on the integration of mathematics with basic and engineering sciences in the solution of a theoretical, experimental, and/or design problem. May be taken more than once for credit.

CENG 480a, Chemical Engineering Process Control Eric Altman

Transient regime modeling and simulations of chemical processes. Conventional and state-space methods of analysis and control design. Applications of modern control methods in chemical engineering. Course work includes a design project. Prerequisite: ENAS 194 or permission of instructor. QR, SC RP

* **CENG 490a or b, Senior Research Project** Michael Loewenberg

Individual research and/or design project supervised by a faculty member in Chemical Engineering, or in a related field with permission of the director of undergraduate studies.

RELATED COURSE THAT COUNTS TOWARD THE MAJOR

MENG 361a, Mechanical Engineering II: Fluid Mechanics Alessandro Gomez
Mechanical properties of fluids, kinematics, Navier-Stokes equations, boundary conditions, hydrostatics, Euler's equations, Bernoulli's equation and applications, momentum theorems and control volume analysis, dimensional analysis and similitude, pipe flow, turbulence, concepts from boundary layer theory, elements of potential flow. Prerequisites: ENAS 194 or equivalent, and physics at least at the level of PHYS 180. QR, SC RP

Chemistry

Director of undergraduate studies: Nilay Hazari (nilay.hazari@yale.edu), 210 KCL, 432-0885 [F]; Patrick Vaccaro (patrick.vaccaro@yale.edu), 240 SCL, 432-3975 [Sp]; chem.yale.edu

The wide range of courses offered by the Department of Chemistry reflects the position of chemistry as the foundation of all the molecular sciences. In addition to graduate work in chemistry, biochemistry, or health-related disciplines, the department's graduates find their broad scientific training useful in fields such as technology policy, business management, and law. Chemistry is an especially appropriate major for students interested in energy research or policy and the environment.

COURSES FOR NONMAJORS WITHOUT PREREQUISITES

The Chemistry department offers one-term courses with no prerequisites, which are intended for non-science majors. These courses do not satisfy medical-school requirements or the general-chemistry requirement for any science major. Courses for nonmajors are numbered CHEM 100–109.

PREREQUISITES AND INTRODUCTORY COURSES

Prerequisite courses Prerequisites common to all four Chemistry degree programs include two terms of general chemistry and laboratory, single-variable calculus at the level of MATH 115, and one term of introductory physics numbered 170 or higher, or the equivalents in advanced placement. Students also are encouraged to complete a course in multivariable calculus (MATH 120 or ENAS 151).

Introductory courses The majority of students begin with a general chemistry sequence: either CHEM 161 and 165 or CHEM 163 and 167. These courses fulfill the prerequisite for general chemistry in the Chemistry major. Students taking CHEM 161 may be taking chemistry for the first time, perhaps took chemistry as a high school sophomore, or even may have taken AP chemistry but did not fully master the subject at that level. Students in CHEM 163 will have more recently completed a year or two of chemistry in high school, although motivated students may have last taken chemistry as a high school sophomore if they have a strong math and physics background. Students who have done well in an advanced placement chemistry course or show other evidence of high achievement in science and mathematics may be given permission to start in CHEM 167. The introductory laboratory sequence is CHEM 134L and 136L; each laboratory course earns one-half course credit.

Students with a sufficiently strong background in chemistry may initiate their studies with courses in organic or physical chemistry after demonstrating proficiency on the department's placement examination. While CHEM 174 and 175 are offered expressly for first-year students, other courses in organic chemistry, including CHEM 220 and 221, also are available to qualified first-year students. Students with a strong background in physics and calculus may be eligible for the physical-chemistry courses CHEM 332 and 333.

PLACEMENT PROCEDURES

For first-year students The Chemistry department reviews the preparation of all first-year students prior to the beginning of the fall term, using test scores, admission

records, and information supplied by students. Incoming students should see the *First-Year Student Handbook* or the Chemistry department website for details on information to submit during the summer before matriculation. The department determines the appropriate general chemistry course for every entering first-year student, either CHEM 161, 163, or 167. Instructions for viewing initial placement are available on the Chemistry department website. Placements will be posted on Canvas@Yale.edu in late August.

First-year students wishing to take CHEM 174, 220, or 332, or those wishing to take a higher-level course than initially assigned, are required to take a placement examination on the first day of registration week in the fall term. Students who feel they have been placed incorrectly at too high a level may discuss changing their placement with a chemistry placement adviser and do not need to take the examination. Students uncertain about their placement are encouraged to sit for the examination, as it provides the best measure of a student's readiness to enter the wide variety of courses offered to first-year students.

Students with placement questions, or those wishing to change their course preference indicated during preregistration, should attend the department's orientation meeting prior to the placement examination. Additional sessions with placement advisers are scheduled throughout the first week of the fall term in 248 SCL at times listed in the *Calendar for the Opening Days of College*. Students wishing to change their placement should consult an adviser as soon as possible.

Students are advised to review general chemistry before taking the placement examination. They must bring a non-programmable, non-graphing calculator and a #2 pencil with them to the examination; cell phones may not be used. Times and places for the examination are published in the *Calendar for the Opening Days of College*. Shortly after the examination, students will be informed of their revised placement. For further information about placement and the examination, consult the *Calendar for the Opening Days of College* and the *First-Year Student Handbook*.

Permission keys Enrollment in any introductory chemistry course requires an electronic permission key. Keys are issued automatically by the department for entering first-year students and are displayed as green key-shaped icons next to the appropriate courses on the online registration page. Students are blocked from enrolling in any chemistry course for which they do not possess a permission key. Students experiencing problems with permission keys should inquire in person at the department office, 248 SCL.

For upper-level students Upper-level students wishing to take CHEM 161, 163, 165, or 167 should confirm their placement on Canvas@Yale by accessing the Chemistry Placement site that corresponds to their year of matriculation. If permission keys are needed, upper-level students should obtain them by inquiring at the department office, 248 SCL. Those wishing to enroll in CHEM 220 may do so as long as they have satisfied the general chemistry prerequisite.

Section registration in laboratory and lecture courses Information about online registration for laboratory and discussion sections can be found in the description for each laboratory or lecture course in Yale Course Search. Due to the nature of laboratory

exercises, it is impractical to preview laboratory courses during the course selection period.

Advanced courses For the purpose of degree requirements, all DUS-approved undergraduate Chemistry courses numbered 410 or higher count as advanced lecture or laboratory courses, as do CHEM 226L, 251L, 331L, and 335L. Because most advanced courses are offered either in the fall term or have a fall-term course as a prerequisite, students should not plan to take an isolated spring-term advanced course in any given year without first consulting the director of undergraduate studies (DUS). Many graduate-level Chemistry courses also may count toward the advanced-course requirement; consult the DUS for information about eligible courses.

For premedical students Medical schools currently require one year of organic chemistry and laboratory as well as one year of general chemistry and laboratory. The general-chemistry requirement may be satisfied by completing CHEM 161 and 165, or CHEM 163 and 167, or two terms of physical chemistry. In most instances students with advanced placement taking only CHEM 167 may complete this requirement by taking a course in biochemistry, inorganic chemistry, or physical chemistry. Students should consult with the Office of Career Strategy for the most up-to-date premedical course advice.

REQUIREMENTS OF THE MAJOR

Four degree programs are offered: a B.A., a B.S., an intensive major leading to a B.S., and a combined B.S./M.S. The B.A. degree is intended for students who want solid training in the chemical sciences and who also intend to study other subjects in which chemical training would be an asset, such as technology policy, economics, the environment, or medicine. The B.S. degree is intended to prepare students for graduate study while permitting extensive exploration of other disciplines. The B.S. degree with an intensive major provides more focused preparation for a career in chemical research, and requires greater breadth in laboratory courses and electives. Students electing this major program also can satisfy the requirements for a certified degree in chemistry as set forth by the American Chemical Society. The combined B.S./M.S. is designed for students whose advanced preparation qualifies them for graduate-level work in their third and fourth years of college.

The major requires a group of prerequisites or their equivalent in advanced placement, a core of courses common to all four degree programs, advanced courses specific to each degree program, and a senior requirement.

Course requirements common to all Chemistry degree programs All degrees require two terms of organic chemistry (CHEM 174 or 220, and CHEM 175, 221, or 230) with laboratory (CHEM 222L and 223L), one term of physical chemistry (CHEM 332 or 328), and one term of inorganic chemistry (CHEM 252).

B.A. degree program The B.A. degree program requires eleven term courses, totaling ten course credits, beyond the prerequisites. In addition to the common degree requirements and one-term senior requirement, the B.A. degree requires four additional course credits of advanced chemistry lecture or laboratory courses. At least one of the advanced courses must be a lecture course in the Chemistry department and at least

one must be a Chemistry laboratory course. CHEM 333 may be counted toward the advanced-course requirement, although not as the sole lecture course.

B.S. degree program The B.S. degree program requires fourteen term courses, totaling thirteen course credits, beyond the prerequisites. In addition to the common degree requirements and two-term senior requirement, the B.S. degree requires completion of a second term of physical chemistry (CHEM 333), one term of physical chemistry laboratory (CHEM 330L), and four additional course credits of advanced chemistry lecture or laboratory courses. At least one of the advanced courses must be a lecture course in the Chemistry department and at least one must be a Chemistry laboratory course.

B.S. degree program, intensive major The B.S. degree program, intensive major requires sixteen term courses, totaling fifteen course credits, beyond the prerequisites. In addition to the common degree requirements and two-term senior requirement, the B.S. degree with an intensive major requires completion of a second term of introductory physics numbered 171 or higher, a second term of physical chemistry (CHEM 333), one term of physical chemistry laboratory (CHEM 330L), and five additional course credits of advanced chemistry lecture or laboratory courses. At least two of the advanced courses must be lecture courses in the Chemistry department and at least one must be a Chemistry laboratory course.

Combined B.S./M.S. degree Exceptionally well-prepared students may complete a course of study leading to the simultaneous award of the B.S. and M.S. degrees after eight terms of enrollment. Formal application for admission to this program must be made no later than the last day of classes in the fifth term of enrollment. To be considered for admission, by the end of their fifth term applicants must have achieved at least two-thirds A or A- grades in all of their course credits as well as in all of the course credits directly relating to the major, including prerequisites. Two terms of CHEM 490 must be taken in the fifth and sixth terms with earned grades of A or A- to continue in the program. The B.S./M.S. degree program requires completion of the intensive major requirements, including the senior requirement, which is typically completed in the fifth and sixth terms. The introductory physics requirement must be fulfilled with PHYS 200 and 201 or 260 and 261; a term course in physics numbered 400 or higher and approved by the Chemistry DUS may be substituted for the introductory sequence. In addition, eight graduate courses in chemistry (four of which count toward the B.S.) are required. Four terms of research are required, including two terms of research taken in CHEM 990. Students in the program must earn grades of A in at least two of their graduate-level term courses (or in one yearlong course) and have at least a B average in other graduate-level courses. B.S./M.S. candidates also are expected to continue their independent research in a summer internship between their junior and senior years. At the end of their eighth semester students are required to write a thesis summarizing their research activities. The thesis must be written under the guidance of the faculty member who supervises the student's research and it must be submitted on the final day of classes of the student's eighth semester to their research adviser. The thesis should be no shorter than twenty-five pages (double-spaced, twelve-point font, excluding figures, tables, and bibliography) and normally should contain the following sections: Introduction, Results and Discussion, Summary and Conclusions, Research Methods, and Bibliography. Students in the B.S./M.S. program also must present their research in the form of a poster

presentation at the end of their sixth semester (to fulfill the requirements of the B.S. degree) and an oral presentation at the end of their eighth semester (to fulfill the requirements of the M.S. degree). Both the poster and oral presentation are coordinated by the instructor of CHEM 490. For more information, see Academic Regulations, section K, Special Arrangements, “Simultaneous Award of the Bachelor’s and Master’s Degrees.”

Credit/D/Fail No chemistry courses taken Credit/D/Fail may be counted toward the major (including substitutions for advanced courses).

Roadmap See visual roadmap of the requirements.

SENIOR REQUIREMENT

For the B.A. degree program Students in the B.A. degree program must complete the senior seminar CHEM 400, in which they prepare a capstone essay on a chemistry-related topic. The paper is expected to be 15–25 pages in length (double-spaced, twelve-point font, exclusive of figures, tables, and bibliography).

For the B.S. degree program Students in the B.S. degree program may fulfill the senior requirement by completing two terms of the independent research course CHEM 490 and writing a capstone report under the guidance of a faculty member that describes their research activities. Alternatively, they may complete the senior seminar CHEM 400, in which they prepare a capstone essay on a chemistry-related topic, and complete one additional course credit of advanced chemistry lecture or laboratory courses. One term of CHEM 490 may be counted as the additional advanced course. The capstone report or essay is expected to be 15–25 pages in length (double-spaced, twelve-point font, exclusive of figures, tables, and bibliography). All students performing research also must present their work in the form of an oral or poster presentation as coordinated by the instructor of CHEM 490.

For the B.S. degree program with an intensive major Students in the B.S. degree program with an intensive major fulfill the senior requirement by completing two terms of the independent research course CHEM 490 and writing a capstone report of 15–25 pages in length (double-spaced, twelve-point font, exclusive of figures, tables, and bibliography) under the guidance of a faculty member that describes their research activities. Students in the intensive major program also must present their work in the form of an oral or poster presentation as coordinated by the instructor of CHEM 490.

ADVISING

Majors are encouraged to begin their programs in the first year to provide the greatest flexibility in scheduling. It is possible, however, to complete the B.S. in as little as six terms if a student has advanced placement. One sample B.S. program follows, but many others are possible:

First-Year	Sophomore	Junior	Senior
CHEM 161, 165, 134L, 136L, math prereq	CHEM 220, 221, 252, 222L, 223L, physics prereq	CHEM 332, 333, 330L, 251L, 1 elective	2 terms of CHEM 490, 2 electives

Substitutions for required courses Up to two terms of advanced science courses outside Chemistry may be counted as electives, with the written approval of the DUS. CHEM 490 may not in any circumstance be substituted for any of the laboratory

requirements. The graduate courses CHEM 562L, 564L, and 565L may not be counted toward any requirement of the major.

Programs of study with special emphasis The flexibility of the degree requirements makes it possible for a student's program of study to emphasize a particular area of specialization in chemistry. For example, a program specializing in chemical biology includes CHEM 421 and two biochemistry electives chosen from MCDB 300, MB&B 300, 301, or selected graduate courses. An inorganic chemistry specialization could include CHEM 450, 452, and 457. A program with emphasis in physical chemistry and chemical physics would have three electives chosen from CHEM 430, 440, 442, 470, or a graduate course in quantum mechanics. Students interested in synthetic organic chemistry complete three electives chosen from CHEM 418, 423, 425, or selected graduate courses. An emphasis in biophysical chemistry includes a course in either chemical biology or biochemistry, as well as two electives chosen from graduate courses in biophysics or biochemistry. Students may design programs with other areas of emphasis in consultation with the DUS. For a list of graduate courses appropriate for a particular specialization, consult the DUS.

Approval of major programs of study All Chemistry majors in the sophomore, junior, and senior years must have their programs approved by the DUS. A program tailored to each student's goals is created and recorded on a Chemistry Course of Study form kept on file in the department office. Majors who have a current course of study form on file may have their schedules signed by the DUS or by any of the advisers to the major. A current list of advisers to the major may be obtained in the department office.

STUDY ABROAD

In most instances, Chemistry majors find their course of study easier to schedule if they choose to study abroad in a spring term. Students studying abroad in the spring term of their junior year are required to obtain approval for the project that will fulfill their senior requirement before the end of the prior term. For general information on the Year or Term Abroad, see Academic Regulations, section K, Special Arrangements, "Year or Term Abroad."

UNIQUE TO THE MAJOR

Special restrictions on lecture courses Completion of the first term of the general, organic, or physical chemistry sequences CHEM 161 and 165; CHEM 174 or 220 and 175, 221, or 230; and CHEM 332 or 328 and 333 with a passing grade is a prerequisite for registration in the subsequent term. Completion of CHEM 163 with a passing grade is a prerequisite for registration in CHEM 167 unless the student's assigned placement is in CHEM 167.

Students receive credit for only one chemistry sequence of any given type. For example, a student who has completed CHEM 161 and 165 may not subsequently enroll in CHEM 163 or 167; a student who has completed CHEM 174 and 175 may not subsequently enroll in CHEM 220, 221, or 230. Similarly, students may not enroll in a course (typically of lower number) that is a prerequisite to a course they already have taken. Thus, for example, a student who has completed an organic chemistry laboratory cannot subsequently enroll in a general chemistry laboratory.

Special restrictions on laboratory courses Chemistry courses may be taken without the accompanying laboratory, although the department does not recommend it. However,

the appropriate lecture course is a prerequisite or corequisite for each laboratory course. This restriction can be waived only by the DUS. Students dropping the lecture course corequisite with a laboratory also must drop the laboratory course.

REQUIREMENTS OF THE MAJOR

Prerequisites CHEM 161 and 165, or 163 and 167; CHEM 134L and 136L; MATH 115 (MATH 120 or ENAS 151 suggested); PHYS 170, 180, 200, or 260; or equivalents in advanced placement

Number of courses *B.A.* – at least 11 term courses, totaling 10 course credits, beyond prereqs (incl senior req); *B.S.* – at least 14 term courses, totaling 13 course credits, beyond prereqs (incl senior req); *B.S., intensive major* – at least 16 term courses, totaling 15 course credits, beyond prereqs (incl senior req)

Specific courses required *All degrees* – 2 terms of organic chem (CHEM 174 or 220, and CHEM 175, 221, or 230); 2 terms of organic chem lab (CHEM 222L and 223L); 1 term of physical chem (CHEM 332 or 328); 1 term of inorganic chem (CHEM 252); *B.S.* – CHEM 330L, 333; *B.S., intensive major* – CHEM 330L, 333; PHYS 171, 181, 201, or 261

Distribution of courses *B.A. and B.S.* – 4 addtl course credits in advanced lectures or labs, incl at least 1 lecture and 1 lab; *B.S., intensive major* – 5 addtl course credits in advanced lectures or labs, incl at least 2 lectures and 1 lab

Substitution permitted Up to 2 relevant advanced science courses in other depts for advanced chem courses with DUS permission

Senior requirement *B.A.* – CHEM 400; *B.S.* – 2 terms of CHEM 490, or CHEM 400 and 1 addtl course credit in advanced lecture or lab; *B.S., intensive major* – 2 terms of CHEM 490; all degree programs require submission of senior capstone essay.

FACULTY OF THE DEPARTMENT OF CHEMISTRY

Professors †Sidney Altman (*Emeritus*), Victor Batista, Gary Brudvig, Robert Crabtree, †Craig Crews, R. James Cross, Jr. (*Emeritus*), Jonathan Ellman, John Faller (*Emeritus*), †Gary Haller (*Emeritus*), Sharon Hammes-Schiffer, Nilay Hazari, Seth Herzon, Patrick Holland, †Francesco Iachello (*Emeritus*), Mark Johnson, William Jorgensen, J. Patrick Loria, James Mayer, J. Michael McBride (*Emeritus*), Scott Miller, Peter Moore (*Emeritus*), †Anna Pyle, †Lynne Regan (*Emeritus*), †James Rothman, Martin Saunders, Alanna Schepartz, Charles Schmuttenmaer, †Dieter Söll, David Spiegel, †Scott Strobel, John Tully (*Emeritus*), Patrick Vaccaro, Kenneth Wiberg (*Emeritus*), Elsa Yan, Frederick Ziegler (*Emeritus*), Kurt Zilm

Associate Professors Jason Crawford, Timothy Newhouse, Hailiang Wang

Assistant Professors Ziad Ganim, †Stavroula Hatzios, Sarah Slavoff

Lecturers Paul Anastas, Paul Cooper, Christine DiMeglio, N. Ganapathi, Jonathan Parr

Preceptors Mioy Huynh, Jenny Martinez

†A joint appointment with primary affiliation in another department.

Courses

For Nonmajors without Prerequisites

CHEM 104b, Chemistry of Food and Cooking Elsa Yan

Fundamental principles for understanding chemical structures and interactions as well as energy and speed of chemical processes. Application of these principles to food and cooking, including demonstrations. This course is designed for non-STEM majors.

Prerequisite: preference given to students who have not taken AP or college-level chemistry. SC

Introductory Courses

First-year students planning to take an introductory Chemistry course during their first term are required to preregister over the summer. Those planning to elect CHEM 174, 220, or 332 also must register in person by taking a placement examination as described in the Chemistry department program description and on the Chemistry website. Placement in other introductory Chemistry courses is made on the basis of test scores and other admissions data, as discussed in the Chemistry department program description. The time and place for the orientation meeting, registration, and placement examination are listed in the *Calendar for the Opening Days of College*. For further information on placement see the Chemistry website.

[**CHEM 119L, Laboratory for Quantitative Foundations of General Chemistry**]

CHEM 134La or b, General Chemistry Laboratory I Narasimhan Ganapathi

An introduction to basic chemistry laboratory methods. Techniques required for quantitative analysis of thermodynamic processes and the properties of gases. To accompany or follow CHEM 161 or 163. May not be taken after a higher-numbered laboratory course. SC RP ½ Course cr

CHEM 136La or b, General Chemistry Laboratory II Narasimhan Ganapathi

Introduction to rate and equilibrium measurements, acid-base chemistry, synthesis of inorganic compounds, and qualitative/quantitative analysis. After CHEM 134L or the equivalent in advanced placement. To accompany or follow CHEM 165 or 167. May not be taken after a higher-numbered laboratory course. SC RP ½ Course cr

* **CHEM 161a or b, General Chemistry I** Staff

A comprehensive survey of modern descriptive, inorganic, and physical chemistry. Atomic theory, stoichiometry, thermochemistry, chemical periodicity, concepts in chemical bonding, and the shapes of molecules. Appropriate either as a first chemistry course or for students with one year of high school chemistry. Attendance at a weekly discussion section required. Normally accompanied by CHEM 134L. Enrollment by placement only. QR, SC RP

* **CHEM 163a, Comprehensive University Chemistry I** James Mayer

An in-depth examination of the principles of atomic, molecular, and solid state chemistry, including structures, periodicity, and chemical reactivity. Topics include the quantum mechanics of atoms and chemical bonding, and inorganic, organic, and solid state molecules and materials. For students with strong secondary school exposure to general chemistry. Attendance at a weekly discussion section required. Normally accompanied by CHEM 134L. Enrollment by placement only. QR, SC RP

*** CHEM 165b, General Chemistry II** Staff

Topics include kinetics, chemical equilibrium, acid-base chemistry, free energy and entropy, electrochemistry, and nuclear chemistry. Attendance at a weekly discussion section required. Prerequisite: CHEM 161. Normally accompanied by CHEM 136L. Enrollment by placement only. QR, SC RP

*** CHEM 167b, Comprehensive University Chemistry II** Staff

Topics include kinetics, chemical equilibrium, acid-base chemistry, free energy and entropy, electrochemistry, and nuclear chemistry. Attendance at a weekly discussion section required. Prerequisite: CHEM 163, or with equivalent placement. Normally accompanied by CHEM 136L. Enrollment by placement only. QR, SC RP

*** CHEM 174a, Organic Chemistry for First Year Students I** Scott Miller

An introductory course focused on current theories of structure and mechanism in organic chemistry, their development, and their basis in experimental observation. Open to freshmen with excellent preparation in chemistry, mathematics, and physics who have taken the department's advanced chemistry placement examination. Attendance at a weekly discussion section required. Normally accompanied by CHEM 222L. Enrollment by placement only. SC RP

*** CHEM 175b, Organic Chemistry for First Year Students II** Timothy Newhouse
Continuation of CHEM 174. Survey of simple and complex reaction mechanisms, spectroscopy, organic synthesis, and the molecules of nature. Attendance at a weekly discussion section required. After CHEM 174. Normally accompanied by CHEM 223L. Enrollment by placement only. SC RP

Intermediate Courses

*** CHEM 220a or b, Organic Chemistry** Staff

An introductory course covering the fundamental principles of organic chemistry. The laboratory for this course is CHEM 222L. After college-level general chemistry. Students who have earned a grade lower than C in general chemistry are cautioned that they may not be sufficiently prepared for this course. Usually followed by CHEM 221 or 230. SC RP

CHEM 221a or b, The Organic Chemistry of Life Processes Staff

The principles of organic reactivity and how they form the basis for biological processes. The laboratory for this course is CHEM 223L. After CHEM 220. Students who have earned a grade lower than C in general chemistry are cautioned that they may not be sufficiently prepared for this course. SC RP

CHEM 222La or b, Laboratory for Organic Chemistry I Christine DiMeglio

First term of an introductory laboratory sequence covering basic synthetic and analytic techniques in organic chemistry. Prerequisite: CHEM 136L or equivalent. After or concurrently with CHEM 174 or 220. SC ½ Course cr

CHEM 223La or b, Laboratory for Organic Chemistry II Christine DiMeglio

Second term of an introductory laboratory sequence covering basic synthetic and analytic techniques in organic chemistry. Prerequisite: CHEM 222L. After or concurrently with CHEM 175, 221, or 230. SC ½ Course cr

*** CHEM 226La, Intensive Advanced Chemistry Laboratory** Jonathan Parr

An intensive course in advanced chemistry laboratory technique intended to bring the student closer to independent research. Included are an independent laboratory project and presentation, introduction to library research, and training in the use of various analytical techniques. Offered subject to available laboratory space and sufficient enrollment. After CHEM 223L. Enrollment is limited; e-mail course instructor for enrollment procedure. WR, SC RP

*** CHEM 230a, Organic Chemistry of Biological Pathways** Staff

Chemical principles that underpin living systems explored through organic chemistry. Examples drawn from chemistry, medicine, biotechnology, and the emergent field of chemical biology. Key conceptual frameworks such as structure, function, and mechanism and their relations to the chemistry of proteins, nucleic acids, selected drugs, and other topics in the life sciences. Mechanistic principles are used to examine enzymatic processes and the role of cofactors in the context of primary metabolism and natural products biosynthesis. After CHEM 220. Students must sign up for discussion sections using the Preference Selection tool. SC

CHEM 251Lb, Inorganic Chemistry Laboratory Jonathan Parr

Introductory laboratory course covering synthetic and physical characterization techniques in inorganic chemistry. Prerequisite: CHEM 119L or 222L; concurrently with or after CHEM 252. SC

CHEM 252b, Introductory Inorganic Chemistry Staff

Principles and applications of modern inorganic chemistry. Introduction to some of the fundamental concepts of solid-state chemistry, coordination chemistry, bioinorganic chemistry, and organometallic chemistry. Prerequisite: college-level general chemistry. After or concurrently with CHEM 220 or by permission of instructor. May not be taken after CHEM 450, 452, or 457. SC RP

CHEM 328a, Physical Chemistry with Applications in the Biological Sciences Staff

Physical chemical principles and their application to the chemical and life sciences. Thermodynamics, chemical and biochemical kinetics, solution physical chemistry, electrochemistry, and membrane equilibria. CHEM 332 is preferred for Chemistry majors. Prerequisites: introductory physics, college-level general chemistry, and single-variable calculus, or permission of instructor; MATH 120 or ENAS 151 suggested. May not be taken after CHEM 332. QR, SC RP

CHEM 330La or b, Laboratory for Physical Chemistry I Paul Cooper

Introduction to the tools and techniques of modern experimental physical chemistry, including analog/digital electronics, quantitative measurements of basic thermodynamic properties, and nuclear magnetic resonance spectrometry. After or concurrently with CHEM 328 or 332. Meets on Wednesday, Thursday, and Friday from 1:30 to 2:20 for the first week of the term. SC RP

CHEM 331Lb, Laboratory for Physical Chemistry II Paul Cooper

Application of physical methods to chemical analysis by spectroscopic and spectrometric techniques. After CHEM 330L. After or concurrently with CHEM 333. Meets on Wednesday, Thursday, and Friday from 1:30 to 2:20 for the first week of the term. SC RP

* **CHEM 332a, Physical Chemistry with Applications in the Physical Sciences I** Staff
A comprehensive survey of modern physical and theoretical chemistry, including topics drawn from thermodynamics, chemical equilibrium, electrochemistry, and kinetics. Prerequisites: introductory physics, college-level general chemistry, and single-variable calculus, or permission of instructor; MATH 120 or ENAS 151 suggested. May not be taken after CHEM 328. QR, SC RP

* **CHEM 333b, Physical Chemistry with Applications in the Physical Sciences II**
Patrick Vaccaro
Continuation of CHEM 332, including topics drawn from quantum mechanics, atomic/molecular structure, spectroscopy, and statistical thermodynamics. Prerequisite: CHEM 328 or 332, or permission of instructor. Recommended preparation: familiarity with differential equations. QR, SC RP

* **CHEM 335Lb, Materials and Biophysical Chemistry Laboratory** Staff
A laboratory course covering physical methods and chemical synthesis in materials and biophysical chemistry. Techniques include solution phase synthesis, solid state synthesis, UV-Vis, fluorescence, optical microscopy, SEM, STM, single molecule fluorescence, and optical trapping methods. After two terms of general chemistry with laboratory, or concurrently with CHEM 333. SC

Advanced Courses

* **CHEM 400a, Current Chemistry Seminar** Jonathan Parr
Designed to engage students in the Chemistry research-seminar program by providing requisite scientific guidance and a forum for directed discussion. Participants explore current avenues of chemical research as presented orally by the prime movers in the field, thereby exploring the frontiers of current knowledge while still retaining the structured environment of a classroom. May fulfill all or part of the senior requirement for the Chemistry major, as detailed in the program description in the YCPS.

* **CHEM 418a, Advanced Organic Chemistry I** Staff
Concise overview of structure, properties, thermodynamics, kinetics, reactions, and intermolecular interactions for organic molecular systems. Prerequisites: two terms of organic chemistry, CHEM 328 or 332, and CHEM 333. SC RP

CHEM 421a, Chemical Biology Alanna Schepartz and Jason Crawford
A one-term introduction to the origins and emerging frontiers of chemical biology. Discussion of the key molecular building blocks of biological systems and the history of macromolecular research in chemistry. Prerequisites: two terms of organic chemistry, and BIOL 101 or equivalent; BIOL 102 recommended. SC

CHEM 423a, Synthetic Methods in Organic Chemistry Jonathan Ellman and Timothy Newhouse
Survey of practical methods in synthetic organic chemistry. Emphasis on learning how to acquire new information and understand chemical reactivity from a fundamental and mechanistic perspective. Prerequisite: two terms of organic chemistry or permission of instructor. SC RP

CHEM 425b, Spectroscopic Methods of Structure Determination Staff
Applications of NMR, ESR, infrared, UV, visible, and mass spectroscopy to chemical problems concerning structures and reactions. X-ray crystallography. Computer

simulation of NMR spectra. Prerequisites: two terms of organic chemistry and CHEM 333. SC RP

CHEM 426b, Computational Chemistry and Biochemistry Sharon Hammes-Schiffer
An introduction to modern computational methods employed for the study of chemistry and biochemistry, including molecular mechanics, quantum mechanics, statistical mechanics, and molecular dynamics. Special emphasis on the hands-on use of computational packages for current applications ranging from organic reactions to protein-ligand binding and dynamics. After organic chemistry and physical chemistry. QR, SC RP

CHEM 430b, Statistical Mechanics and Thermodynamics Victor Batista
The fundamentals of statistical mechanics developed and used to elucidate gas phase and condensed phase behavior, as well as to establish a microscopic derivation of the postulates of thermodynamics. Topics include ensembles; Fermi, Bose, and Boltzmann statistics; density matrices; mean field theories; phase transitions; chemical reaction dynamics; time-correlation functions; and Monte Carlo and molecular dynamics simulations. Prerequisites: CHEM 328 or 332, and CHEM 333, or permission of instructor. QR, SC RP

CHEM 437a, Chemistry of Isotopes Staff
Advanced applications of isotopes to chemical problems and the theory associated with them, including kinetic and equilibrium isotope effects, tracer applications, and dating. RP

CHEM 440a, Molecules and Radiation I Kurt Zilm
An integrated treatment of quantum mechanics and modern spectroscopy. Basic wave and matrix mechanics, perturbation theory, angular momentum, group theory, time-dependent quantum mechanics, selection rules, coherent evolution in two-level systems, line shapes, Bloch equations, and NMR spectroscopy. Prerequisite: CHEM 333 or permission of instructor. QR, SC RP

CHEM 442b, Molecules and Radiation II Charles Schmuttenmaer
An extension of the material covered in CHEM 440 to atomic and molecular spectroscopy, including rotational, vibrational, and electronic spectroscopy, as well as an introduction to laser spectroscopy. Prerequisite: CHEM 440 or permission of instructor. QR, SC RP

[CHEM 450, Physical Methods in Inorganic Chemistry]

CHEM 452a, Organometallic Chemistry Robert Crabtree
A survey of the organometallic chemistry of the transition elements and of homogeneous catalysis. May be taken independently of CHEM 450. Prerequisites: two terms of organic chemistry and CHEM 252. SC RP

CHEM 457a, Modern Coordination Chemistry James Mayer
The principles of modern inorganic chemistry. Main group and transition element chemistry: reactions, bonding, structure, and spectra. Prerequisite: CHEM 252 or permission of instructor. SC RP

CHEM 470a, Quantum Chemistry Sharon Hammes-Schiffer
The elements of quantum mechanics developed and illustrated with applications in chemistry and chemical physics. Prerequisites: CHEM 333, and MATH 120 or ENAS 151. QR, SC RP

*** CHEM 480a or b, Introduction to Independent Research in Chemistry** Staff

After consultation with the DUS, students engage individual experimental and/or theoretical research problems in the laboratories of a selected faculty member within the Chemistry department. At the end of the term, students submit a brief report summarizing goals, methods, and accomplishments. For each term of enrollment, students must complete the CHEM 480 registration form, available in the DUS office, and have it signed by their faculty research mentor. It must be submitted to the Chemistry DUS for final approval no later than the last week of classes in the immediately preceding academic term. Individuals wishing to perform independent research must have demonstrated proficiency in the aspects of chemistry required for the planned project, as ascertained by the supervising faculty member, and must meet basic safety requirements prior to undertaking any activities, including certified completion of the online courses entitled *Laboratory Chemical Training* and *Hazardous Chemical Waste Training* administered by the Office of Environmental Health and Safety (EHS) at <http://ehs.yale.edu/training>. At least ten hours per week of research are required (including time spent on requisite safety training), with the faculty mentor affirming this level of student commitment by midterm. This course may be taken multiple times for Pass/Fail credit, subject to restrictions imposed by Yale College. RP

*** CHEM 490a or b, Independent Research in Chemistry** Staff

Senior Chemistry majors engage individual experimental and/or theoretical research problems in the laboratories of a selected faculty member in the Chemistry department or in a closely related field of molecular science. CHEM 490 registration forms, found in the DUS office, must be signed by the student's faculty research mentor and submitted to the Chemistry DUS for final approval no later than the last week of classes in the immediately preceding academic term. Mandatory class meetings address issues of essential laboratory safety and ethics in science, with other class sessions focusing on core topics of broad interest to Chemistry students, including online literary research, oral presentation skills, and effective scientific writing. At least ten hours of research are required per week. Students are assigned letter grades, subject to restrictions imposed by Yale College. In special cases and with DUS approval, juniors may take this course. RP

GRADUATE COURSES OF INTEREST TO UNDERGRADUATES

Graduate courses in chemistry that may be of particular interest to undergraduates are listed in the online bulletin of the Graduate School. Information about them is available in the office of the director of undergraduate studies. Enrollment requires permission of both the director of graduate studies and the instructor, with pre-approval by the director of undergraduate studies if credit towards the requirements of the major is being sought.

Child Study Center

The Child Study Center is a department at Yale University School of Medicine which brings together multiple disciplines to further the understanding of the problems of children and families. Among the many disciplines are child psychiatry, pediatrics, genetics, neurobiology, epidemiology, psychology, nursing, social work, and social policy. The mission of the Yale Child Study Center is to improve the mental health of children and families, advance understanding of their psychological and developmental needs, and treat and prevent childhood mental illness through the integration of research, clinical practice, and professional training. The Child Study Center is unique in its scope of research, clinical services, training programs, policy work, and its local, state, national, and international collaborations. The strengths of the Center are reflected in the breadth and integrative nature of research, clinical services and training. More information is available on the on the Child Study Center's website.

Courses

* **CHLD 125a / EDST 125a / PSYC 125a, Child Development** Nancy Close and Carla Horwitz

The reading of selected material with supervised participant-observer experience in infant programs, a day-care and kindergarten center, or a family day-care program. Regularly scheduled seminar discussions emphasize both theory and practice. An assumption of the course is that it is not possible to understand children – their behavior and development – without understanding their parents and the relationship between child and parents. The focus is on infancy as well as early childhood. Enrollment limited to juniors and seniors. WR, SO

* **CHLD 126b / EDST 191b, Clinical Child Development and Assessment of Young Children** Nancy Close

Exposure to both conceptual material and clinical observations on the complexity of assessing young children and their families. Prerequisites: CHLD 125 or CHLD 128. SO
½ Course cr

* **CHLD 127a or b / EDST 127a or b / PSYC 127a or b, Theory and Practice of Early Childhood Education** Carla Horwitz

Development of curricula and responsive educational environments for young children – in light of current research and child development theory. The course focuses on critical analysis of programs for young children and the ways in which political context contributes to the practice of education. Regularly scheduled seminar discussions emphasize both theory and practice. Supervised participant-observer experience in an early childhood classroom. Components of the course include behavior and development, planning, assessment and standards, culture, teacher preparation, and working with families. Priority given to seniors, juniors and Ed Studies students. WR, SO RP

* **CHLD 128b / EDST 128b / PSYC 128b, Language, Literacy, and Play** Nancy Close and Carla Horwitz

The course focuses on the complicated role play has in the development of language and literacy skills among preschool and kindergarten-aged children. It examines how teachers integrate language, literacy, and play in a developmentally appropriate early

childhood education curriculum. Topics include social-emotional, cross-cultural, cognitive, and communicative aspects of play. WR, SO RP

* **CHLD 334a / PSYC 334a, Developmental Psychopathology** Fred Volkmar, Eli Lebowitz, and Denis Sukhodolsky

Study of developmental psychopathology during childhood and adolescence, team taught by a child psychiatrist and three psychologists. Topics include: aspects of normal development, assessment methods, clinical disorders, treatment, and legal and social policy issues. Review of normative development, followed by discussion of theoretical approaches to understanding developmental aspects of common mental health conditions in childhood. Attention to treatment models as well as relevant issues of culture and ethnicity in the expression of psychopathology. Prerequisites: PSYC 130, 140, 180, or equivalent, or with permission of instructor.

* **CHLD 350b / EDST 350b / PSYC 350b, Autism and Related Disorders** Fred Volkmar and James McPartland

Weekly seminar focusing on autism and related disorders of socialization. A series of lectures on topics in etiology, diagnosis and assessment, treatment and advocacy, and social neuroscience methods; topics cover infancy through adulthood. Supervised experience in the form of placement in a school, residence, or treatment setting for individuals with autism spectrum disorders. Details about admission to the course are explained at the first course meeting. Prerequisite: an introductory psychology course.
SO

Classics

Director of undergraduate studies: Andrew Johnston (andrew.johnston@yale.edu),
204 Phelps Hall

The Department of Classics offers a major in Classics, concentrating in either Greek or Latin literature, or in both literatures; a major in Classical Civilization; and, in conjunction with the Hellenic Studies program, a major in Ancient and Modern Greek. The diversity of subject matter covered by these majors makes Classics an excellent partner in interdepartmental major programs. Programs for all majors must be approved by the director of undergraduate studies (DUS).

PLACEMENT PROCEDURES

Students are encouraged to take courses as advanced as they can handle with profit and pleasure. The department, recognizing the great variety of preparation in ancient languages, wishes to accommodate incoming students in as flexible a manner as possible. Students who plan either to begin or to continue the study of Greek or Latin should consult members of the departmental faculty as soon as practicable.

Students who have had the equivalent of two years of college-level instruction may try a 400-level course. It is possible to take GREK 141 or LATN 141 after a 400-level course, or to be admitted to a 400-level course after completion of GREK 131 or LATN 131. First-year students are encouraged to take advantage of the initial course selection period before course schedules are due to find the most appropriate course.

REQUIREMENTS OF THE MAJOR IN CLASSICS

The major in Classics is primarily a liberal arts major. It provides a rigorous interdisciplinary education in the literature, material culture, and history that underlie Western civilization and other humanities disciplines; it can also provide foundational disciplinary expertise for students who wish to do professional graduate work. Students develop a mastery of the classical languages, become acquainted with important periods and major authors in Greek and Roman literature, and develop the linguistic, historical, and theoretical interpretative tools to analyze classical antiquity and its relevance in the modern world. All courses in the department emphasize a combination of precise analysis, original thought, creativity, and breadth of historical inquiry. Courses in other literatures, in history, in art history, and in philosophy are strongly recommended for students enrolled in the Classics major.

The candidate for the Classics major may elect either the standard or the intensive major. In both of these majors the department recognizes two kinds of concentration, one aiming at knowledge of both ancient literatures, the other concentrating on either Greek or Latin literature.

The standard major A standard major in two literatures requires no fewer than ten term courses. These include six term courses in Greek and Latin at the level of 390 or above, a survey of the literature and culture of ancient Athens (CLCV 256, which can be substituted with another course in Greek history or culture if CLCV 256 is not offered a particular year), a survey of the literature and culture of ancient Rome (CLCV 257, which can be substituted with another course in Roman history or culture if CLCV 257 is not offered a particular year), and two additional courses in related areas of history

and art. The language courses must include GREK 403 or LATN 390 and five term courses at the level of 400 or above. One of the additional courses in a related field must be a term course in ancient history, and the other must be a term course in ancient history, classical art and archaeology, or classical civilization.

Students majoring in one literature (Greek or Latin) are required to take no fewer than ten term courses. These include six term courses in that literature at the level of 390 or above, a survey of the literature and culture of ancient Athens, CLCV 256 (which can be substituted with another course in Greek history or culture if CLCV 256 is not offered a particular year), a survey of the literature and culture of ancient Rome, CLCV 257 (which can be substituted with another course in Roman history or culture if CLCV 257 is not offered a particular year), a term course in ancient history related to the chosen literature, and an additional term course in ancient history, classical art and archaeology, or classical civilization. The language courses must include GREK 403 or LATN 390 and at least five term courses at the level of 400 or above. Students are encouraged to do some work in the second language and may substitute two terms at the intermediate level (131 and 141) or higher in the second language for two 400-level courses in the major literature. One of the additional courses in a related field must be a term course in ancient history, and the other must be a term course in ancient history, classical art and archaeology, or classical civilization.

The intensive major Students who desire a larger measure of independence than the standard major offers may elect the intensive major. In addition to fulfilling the requirements of the standard major (in both literatures, in Greek, or in Latin), students in the intensive major write a senior essay under the regular guidance of a faculty adviser.

Combined B.A./M.A. degree Exceptionally able and well-prepared students may complete a course of study leading to the simultaneous award of the B.A. and M.A. degrees after eight terms of enrollment. See Academic Regulations, section K, Special Arrangements, "Simultaneous Award of the Bachelor's and Master's Degrees" in the Academic Regulations." Interested students should consult the DUS prior to the sixth term of enrollment for specific requirements in Classics.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

SENIOR REQUIREMENT

For the standard major At the end of the senior year the student majoring in both Greek and Latin takes a comprehensive examination in the history of Greek and Latin literature and culture and in translation of both languages; the student majoring in either Greek or Latin takes a senior departmental examination in the history of the literature of the major and in translation of that literature.

For the intensive major Students may write a one-term essay in either the fall or spring (CLSS 492), or they may write a two-term essay (CLSS 490 and 491) starting in the fall of their senior year. A brief prospectus of the essay must be submitted, preferably at the end of the junior year and in no case later than the end of September of the senior year. The candidate must submit two copies of the senior essay to the DUS

no later than December 6 (CLSS 492) or April 17 (CLSS 490, 491 or 492) of the senior year.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 10 term courses

Specific courses required GREK 403 or LATN 390; CLCV 256 and 257

Distribution of courses *Two literatures*—6 courses in both langs at level 390 or above, with one of those being GREK 403 or LATN 390, and at least 5 at 400 level or above; 1 course in ancient hist; 1 addtl course in ancient hist, classical art and archaeology, or classical civ; *One literature*—6 courses in lit at level 390 or above, with one of those being GREK 403 for the Greek major and LATN 390 for the Latin major, and at least 5 at 400 level or above; 1 course in ancient hist related to lit of major; 1 addtl course in ancient hist, classical art and archaeology, or classical civ

Substitution permitted *One literature*—2 courses in the other lit numbered 131 or higher for 2 courses in major lit at 400 level; *All majors*—a course in Greek history or culture for CLCV 256 and/or a course in Roman history or culture for CLCV 257, if they are not offered in a particular year

Senior requirement *Two literatures*—senior dept exam in hist and translation of Greek and Latin lit; *One literature*—senior dept exam in hist and translation of major lit

Intensive major Senior essay (CLSS 490, 491 or CLSS 492) in addition to above

REQUIREMENTS OF THE MAJOR IN CLASSICAL CIVILIZATION

The major in Classical Civilization is designed to offer students an opportunity to study an entire Western civilization in its many diverse but related aspects. The literature, history, philosophy, religion, art, archaeology, and other aspects of Greek and Roman antiquity from the earliest beginnings in Greece to the Middle Ages are studied for their intrinsic artistic value, their historical significance, and their power to illuminate problems confronting contemporary societies. Each year, the department offers courses that focus on ways that subsequent ages have used and made sense of classical antiquity. Ancient texts are studied primarily in translation, under the guidance of instructors who have expertise in Greek and Latin.

Candidates for the major complete at least twelve term courses (including the senior essay) in Classics and related departments. Of these, two must be in ancient history and/or classical art and archaeology; and two must be in Greek or Latin, or both, numbered 131 or higher (the latter courses should be completed by the end of the junior year). Students must also take a survey of the literature and culture of ancient Athens, CLCV 256 (which can be substituted with another course in Greek history or culture if CLCV 256 is not offered a particular year) and a survey of the literature and culture of ancient Rome, CLCV 257 (which can be substituted with another course in Roman history or culture if CLCV 257 is not offered a particular year). It is strongly recommended that candidates elect one course each in the general areas of ancient epic, drama, philosophy, Roman civilization, and the classical tradition. Candidates for the major are encouraged to take related courses in other departments.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

SENIOR REQUIREMENT

Students research and complete an original research project, usually an essay, under the guidance of a faculty adviser. Students choose either a two-term senior project for two course credits (CLCV 450, 451) or a one-term senior project for one course credit (CLCV 452). Students who elect the one-term senior project need to take one additional course towards the major. A brief prospectus of the project must be submitted to the DUS, preferably at the end of the junior year and in no case later than the end of September of the senior year. The completed project must be submitted to the department no later than December 6 (CLCV 452) or April 17 (CLCV 450, 451 or CLCV 452) of the senior year.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 12 term courses (incl a two-term senior essay, or a one-term senior essay and an additional course)

Specific courses required CLCV 256 and 257

Distribution of courses 2 courses in ancient hist and/or classical art and archaeology; 2 courses in Greek or Latin (or both) numbered 131 or higher

Substitution permitted a course in Greek history or culture for CLCV 256, and/or a course in Roman history or culture for CLCV 257, if they are not offered in a particular year

Senior requirement Senior project (CLCV 450, 451 or CLCV 452 and an additional course)

REQUIREMENTS FOR THE MAJOR IN ANCIENT AND MODERN GREEK

The major in Ancient and Modern Greek offers students an opportunity to integrate the study of postclassical Greek language, history, and culture with the departmental program in ancient Greek and classical civilization. The major covers Hellenic civilization from the Bronze Age to the modern day, and traces the development of the language and the culture across traditionally drawn boundaries. The study of both ancient and modern Greek allows the student to appreciate how familiarity with one enriches understanding of the other, and to chart the development of a language which has one of the oldest continuous written traditions in the world. The literature, history, philosophy, religion, and art of the ancient Greek and Greco-Roman worlds are studied both as ends in themselves and also as a foundation for appreciating later (medieval, Ottoman, and modern) developments in these areas. Students are encouraged to develop a sense of the continuity of Greek language and culture, and an understanding of how Byzantine and modern forms relate to their ancient forebears.

The standard major The major in Ancient and Modern Greek requires at least ten term courses. These include four term courses at the level of 390 or above in ancient Greek, a survey of the literature and culture of ancient Athens, CLCV 256 (which can be substituted with another course in Greek history or culture if CLCV 256 is not offered a particular year), a survey of the literature and culture of ancient Rome, CLCV 257 (which can be substituted with another course in Roman history or culture if CLCV 257 is not offered a particular year), and one term course in ancient Greek history. The language courses should include GREK 403. Candidates are

encouraged to take a wide range of courses in the areas of ancient philosophy, religion, art, and architecture. In addition, no fewer than two term courses in modern Greek must be elected at the intermediate level (MGRK 130, 140) or above, as well as at least one additional term course in the history, art history, literature, or culture of the Greek-speaking Balkans or the Hellenic diaspora in the medieval, Ottoman, or modern period.

The intensive major Students who desire a larger measure of independence than the standard major offers may elect the intensive major. In addition to fulfilling the requirements of the standard major, students in the intensive major write a senior essay under the regular guidance of a faculty adviser.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

SENIOR REQUIREMENT

The standard major At the end of the senior year the student takes a comprehensive examination in the history of Greek literature and culture.

The intensive major Students may write a one-term essay in the fall or spring (CLSS 492), or they may write a two-term essay starting in the fall of their senior year (CLSS 490 and 491). A brief prospectus of the essay must be submitted, preferably at the end of the junior year and in no case later than the end of September of the senior year. The candidate must submit two copies of the senior essay to the DUS no later than December 6 (CLSS 492) or April 17 (CLSS 490, 491, or CLSS 492) of the senior year.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 10 term courses

Specific courses required GREK 403; CLCV 256 and 257

Distribution of courses 4 term courses in ancient Greek numbered 390 or higher; 1 term course in ancient Greek hist; 2 term courses in modern Greek numbered 130 or higher; 1 term course in postclassical Greek hist or culture

Substitution permitted a course in Greek history or culture for CLCV 256, and/or a course in Roman history or culture for CLCV 257, if they are not offered in a particular year

Senior requirement Senior dept exam

Intensive major Senior essay (CLSS 490, 491 or CLSS 492) in addition to above

CERTIFICATE OF ADVANCED LANGUAGE STUDY

The Classics Department offers a Certificate of Advanced Language Study to non-majors in ancient Greek and in Latin. A certificate adviser, typically the director of undergraduate studies (DUS), advises students on the certification process and certifies to the University Registrar's Office that students have completed the stated requirements before the end of eight terms of study. The Certificate of Advanced Language Study, once certified, is listed on student transcripts.

REQUIREMENTS

Students seeking to earn the certificate are required to take four courses in ancient Greek or Latin beyond the L4 level (four L5 courses; 400-level Greek or 400-level Latin

courses), at least two of which must be Yale courses designated as L5. All courses must be taken for a letter grade, and students must achieve a grade of B or above. With the approval of the certificate adviser, one course, conducted in the target language, such as an independent study course, a graduate seminar, or an advanced seminar may count toward certification requirements.

The adviser may also approve the substitution of up to two credits earned during study abroad and taught in the target language to count toward the certificate requirements. If the adviser approves courses taken outside of Yale for inclusion in the certificate requirements, students must take the necessary steps to ensure those courses appear on their transcript.

Credit/D/Fail No courses taken Credit/D/Fail may be counted toward the requirements of the certificate.

For additional questions or concerns, please contact the DUS in Classics, Professor Pauline LeVen (pauline.leven@yale.edu).

FACULTY OF THE DEPARTMENT OF CLASSICS

Professors Egbert Bakker, Kirk Freudenburg, Emily Greenwood, Verity Harte, Brad Inwood, Diana Kleiner, Christina Kraus, Noel Lenski, Joseph Manning

Associate Professors Milette Gaifman, Andrew Johnston, Pauline LeVen, Irene Peirano Garrison

Assistant Professor Jessica Lamont

Lecturers Francoise Gerardin, Ann Ellis Hanson, Susan Matheson, Timothy Robinson, Barbara Shailor, Joseph Solodow

Courses

Greek

GREK 110a, Beginning Greek: The Elements of Greek Grammar Zachary Wolens
Introduction to ancient Greek. Emphasis on morphology and syntax within a structured program of readings and exercises. Prepares for GREK 120. No prior knowledge of Greek assumed. L1 RP 1½ Course cr

GREK 120b, Beginning Greek: Review of Grammar and Selected Readings Kyle Conrau-Lewis
Continuation of GREK 110. Emphasis on consolidating grammar and on readings from Greek authors. The sequence GREK 110, 120 prepares for 131 or 141. Prerequisite: GREK 110 or equivalent. L2 RP 1½ Course cr

* **GREK 125b, Intensive Beginning Greek** Timothy Robinson
An introduction to classical Greek for students with no prior knowledge of the language. Readings from Greek authors supplement intensive instruction in grammar and vocabulary. The course is intended to be of use to students with diverse academic backgrounds and interests. Prepares for GREK 131. Not open to students who have taken GREK 110, 120. L1, L2 RP 2 Course cr

GREK 131a, Greek Prose: An Introduction Pauline LeVen

Close reading of selections from classical Greek prose with review of grammar. Counts as L4 if taken after GREK 141 or equivalent. L3

GREK 141b, Homer: An Introduction Christopher Londa

A first approach to reading Homeric poetry in Greek. Selected books of the *Iliad* or the *Odyssey*. Counts as L4 if taken after GREK 131 or equivalent. L3

*** GREK 419a, Helen After Troy** Pauline LeVen

Focus on the representation of Helen of Troy in Homer, Sappho, and other lyric poets. Readings from Gorgias's *Encomium of Helen*, Euripides' *Helen*, and Longus. Attention to problems of aesthetics, rhetoric, and poetics. L4 Greek or permission of the instructor. L5

*** GREK 443b, Homer's Iliad** Pauline LeVen

Reading of selected books of the *Iliad*, with attention to Homeric language and style, the Homeric view of heroes and gods, and the reception of Homer in antiquity. L5, HU

Latin

LATN 110a, Beginning Latin: The Elements of Latin Grammar Staff

Introduction to Latin. Emphasis on morphology and syntax within a structured program of readings and exercises. Prepares for LATN 120. No prior knowledge of Latin assumed. Preregistration, which is required, takes place at the Academic Fair. See the *Calendar for the Opening Days* or the departmental Web site for details about preregistration. L1 RP 1½ Course cr

LATN 120b, Beginning Latin: Review of Grammar and Selected Readings Staff

Continuation of LATN 110. Emphasis on consolidating grammar and on readings from Latin authors. The sequence LATN 110, 120 prepares for 131 or 141. Prerequisite: LATN 110 or equivalent. L2 RP 1½ Course cr

LATN 131a, Latin Prose: An Introduction Irene Peirano

Close reading of a major work of classical prose; review of grammar as needed. Counts as L4 if taken after LATN 141 or equivalent. L3

LATN 141b, Latin Poetry: An Introduction Niek Janssen

The course is devoted to Vergil. Counts as L4 if taken after LATN 131 or equivalent. L3

*** LATN 390b, Latin Syntax and Stylistics** Joseph Solodow

A systematic review of syntax and an introduction to Latin style. Selections from Latin prose authors are read and analyzed, and students compose short pieces of Latin prose. For students with some experience reading Latin literature who desire a better foundation in forms, syntax, idiom, and style. L5, HU

*** LATN 410a, Livy's Rome** Christina Kraus

Close reading of selections from Livy's *Ab Urbe Condita*, including Books V and XXI in Latin and additional books in English translation. The nature of representation; Augustan elements in Livy's work; themes and plots of Livian history; Livy and other Roman historians; comparison of ancient historiography and contemporary historical writing. L5, HU

LATN 411a, Early Rome from Aeneas to Romulus Joseph Solodow

Investigation of how the Romans imagined the founding of their nation and their city, events to which they attached the highest importance yet about which they had little

information. Careful reading of both prose and verse by Vergil, Livy, Ovid, and others. A bridge course between L4 and other L5 courses. L5, HU

LATN 424a, Latin Lyric Irene Peirano

Reading and analysis of selections from the canon of Latin lyric poetry. Focus on Horace's *Odes*, with some attention to his *Epodes* and to works by Catullus and lesser-known Republican poets. Emphasis on literary interpretation. L5

LATN 440b, Roman Friendship Christina Kraus

Readings from works by Catullus (selected poems), Cicero (*De Amicitia*), Horace (*Epistles I*), Seneca the Younger and Pliny the Younger (selected letters). The concept of friendship and its importance in Roman society; comparison with other societies. A bridge course between L4 and other L5 courses. L5, HU

* **LATN 450b, Roman Dining** Kirk Freudenburg

A course designed to bridge the gap between advanced high school Latin, or Latin at the L4 level, and Latin at the L5 level. Readings in Latin, with secondary readings in English, on the topic of food, drink, and the protocols of dining in ancient Rome. Prerequisite: L4 Latin course or advanced high school Latin. L5

Classics

* **CLSS 402b, Advanced Latin Paleography** Barbara Shailor

The challenges of using hand-produced Latin manuscripts in research, with an emphasis on texts from the late Middle Ages. Gothic cursive scripts and bookhands c. 1200–c. 1500; fragments of unidentified codices; complex or composite codices with heavy interlinear and marginal annotations. Manuscripts and fragments selected largely from collections in the Beinecke Library. Prerequisite: CLSS 401 or permission of instructor. L5, HU

* **CLSS 430a, Medical Thought in Greek and Latin Literature** Staff

Classical understandings of the human body and medical science as reflected in ancient Greek and Roman epic, history, drama, and other literature. Medical concepts of the body's functioning in sickness and health, from birth and growth to old age and death, and their influence on literary accounts of human activity. Prerequisite: GREK 131 or 141, or LATN 131 or 141, or with permission of instructor. HU

* **CLSS 490a, Two-Term Senior Essay for the Intensive Major in Classics** Andrew Johnston

Qualified students may write a two-term senior essay in ancient literature or classical archaeology under the guidance of a faculty adviser. A written statement of purpose must be submitted to the director of undergraduate studies.

CLSS 492a, One-Term Senior Essay for the Intensive Major in Classics Andrew Johnston

Qualified students may write a one-term senior essay in ancient literature or classical archaeology under the guidance of a faculty adviser. A written statement of purpose must be submitted to the director of undergraduate studies.

Classical Civilization

* CLCV 034a / HIST 037a / HSHM 002a, **Medicine and Disease in the Ancient World**

Jessica Lamont

Examination of ancient medicine considering modern fields of pathology, surgery, pharmacology, therapy, obstetrics, psychology, anatomy, medical science, ethics, and education, to gain a better understanding of the foundations of Western medicine and an appreciation for how medical terms, theories, and practices take on different meanings with changes in science and society. All readings in English. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.

HU

* CLCV 059b / ARCG 031b / EVST 030b / HIST 020b / NELC 026b, **Rivers and Civilization**

Harvey Weiss

The appearance of the earliest cities along the Nile and Euphrates in the fourth millennium B.C. Settlements along the rivers, the origins of agriculture, the production and extraction of agricultural surpluses, and the generation of class structures and political hierarchies. How and why these processes occurred along the banks of these rivers; consequent societal collapses and their relation to abrupt climate changes.

Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU, SO

CLCV 125a / PHIL 125a, **Introduction to Ancient Philosophy**

Verity Harte

An introduction to ancient philosophy, beginning with the earliest pre-Socratics, concentrating on Plato and Aristotle, and including a brief foray into Hellenistic philosophy. Intended to be taken in conjunction with PHIL 126. WR, HU

CLCV 160b / ARCG 243b / HSAR 243b, **Greek Art and Architecture**

Milette Gaifman

Monuments of Greek art and architecture from the late Geometric period (c. 760 B.C.) to Alexander the Great (c. 323 B.C.). Emphasis on social and historical contexts. HU

CLCV 170a / ARCG 170a / HSAR 250a, **Roman Art: Empire, Identity, and Society**

Diana Kleiner

Masterpieces of Roman art from the Republic to Constantine studied in their historical and social contexts. The great Romans and the monuments they commissioned—portraits, triumphal arches, columns, and historical reliefs. The concept of empire and imperial identity, politics and portraiture, the making and unmaking of history through art, and the art of women, children, freedmen, and slaves. HU

CLCV 175b / ARCG 252b / HSAR 252b, **Roman Architecture**

Diana Kleiner

The great buildings and engineering marvels of Rome and its empire. Study of city planning and individual monuments and their decoration, including mural painting. Emphasis on developments in Rome, Pompeii, and central Italy; survey of architecture in the provinces. HU

CLCV 205b / HIST 205b / HUMS 143b, **Introduction to Ancient Greek History**

Jessica Lamont

Introduction to Greek history, tracing the development of Greek civilization as manifested in the political, military, intellectual, and creative achievements from the Bronze Age through the end of the Classical period. Students read original sources in translation as well as secondary scholarship to better understand the rise and fall of the ancient Greeks—the civilization at the very heart of Western Civilization. HU

CLCV 206a / HIST 217a / HUMS 144a, The Roman Republic Andrew Johnston

The origins, development, and expansion of Rome from the earliest times to the deaths of Caesar and Cicero. Cultural identity and interaction; slavery, class, and the family; politics, rhetoric, and propaganda; religion; imperialism; monumentality and memory; and the perception and writing of history. Application of literary and archaeological evidence. HU

CLCV 207b / HIST 218b, The Roman Empire Andrew Johnston

The history of the Roman Empire from its establishment by Augustus to the reign of Justinian. Attention to social, intellectual, and religious changes, as well as to the framework of historical events within which these changes took place, and to the processes by which the Roman Empire was replaced by the institutions of the Western Middle Ages and the Byzantine Empire. HU

*** CLCV 216a / LITR 239a / MGRK 216a / WGSS 209a, Dionysus in Modernity**

George Syrimis

Modernity's fascination with the myth of Dionysus. Questions of agency, identity and community, and psychological integrity and the modern constitution of the self. Manifestations of Dionysus in literature, anthropology, and music; the Apollonian-Dionysiac dichotomy; twentieth-century variations of these themes in psychoanalysis, surrealism, and magical realism. HU TR

*** CLCV 230b / ARCG 424b / HSAR 424b, eClavdia: Women in Ancient Rome** Diana

Kleiner

The contributions of Roman women to one of the greatest cities – and one of the greatest empires – in world history. Lost stories of real-life Roman women recovered from public and residential buildings, portraits, paintings, and other works of Roman art and architecture. HU RP

CLCV 236b / HIST 225b, Roman Law Noel Lenski

Basic principles of Roman law and their applications to the social and economic history of antiquity and to the broader history of international law. Topics include the history of persons and things, inheritance, crime and tort, and legal procedure. Questions of social and economic history and the history of jurisprudence from the fifth century B.C.E. to the present. HU

CLCV 311a / HIST 311a, Egypt of the Pharaohs Joseph Manning

Egypt was among the first centralized territorial states in the world, and, because Egyptian history offers us 4000 years of institutional development and change, the focus of this course is on the long-term development of the ancient Egyptian state, its institutions, and its culture. The course introduces students to the history and culture of ancient Egypt from the rise of the central state to the early Christian period. General historical trends, the relationship of Egyptian history to other contemporary ancient cultures, and the legacy of Egypt to the “West” are also considered. At the end of the course, students have an understanding of the material culture and the historical development of ancient Egypt, and an appreciation for the relationship of the ancient sources to the construction of ancient Egyptian history. HU

*** CLCV 319b / HIST 242Jb / MGRK 300b / WGSS 293b, The Olympic Games, Ancient and Modern** George Syrimis

Introduction to the history of the Olympic Games from antiquity to the present. The mythology of athletic events in ancient Greece and the ritual, political, and social

ramifications of the actual competitions. The revival of the modern Olympic movement in 1896, the political investment of the Greek state at the time, and specific games as they illustrate the convergence of athletic cultures and sociopolitical transformations in the twentieth century. HU

*** CLCV 450a, Two-Term Senior Project for the Major in Classical Civilization**

Andrew Johnston

Qualified students may write a two-term senior essay under the guidance of a faculty adviser. An appropriate instructor is assigned to each student by the director of undergraduate studies in consultation with the student. In the first term, selected readings compensate for individual deficiencies and help the student achieve a balanced overview. In the second term, students select a topic for research from any area of the literature, history, culture, or philosophy of ancient Greece, Rome, or Hellenistic Egypt, or a topic from the classical tradition.

*** CLCV 452a, One-Term Senior Project for the Major in Classical Civilization**

Andrew Johnston

A one-term senior project. Students select a topic for research from any area of the literature, history, culture, or philosophy of ancient Greece, Rome, or Hellenistic Egypt, or a topic from the classical tradition. An appropriate instructor is assigned to each student by the director of undergraduate studies in consultation with the student.

GRADUATE COURSES OF INTEREST TO UNDERGRADUATES

Various graduate seminars are open to juniors and seniors with the qualifications expected of graduate students, i.e., proficiency in the pertinent ancient and modern languages. Descriptions of the courses are available from the director of undergraduate studies. Permission is required of the instructor, the director of undergraduate studies, and the director of graduate studies.

Cognitive Science

Director of undergraduate studies: Joshua Knobe (joshua.knobe@yale.edu), 102 C, 432-1699; www.yale.edu/cogsci

Cognitive science explores the nature of cognitive processes such as perception, reasoning, memory, attention, language, decision making, imagery, motor control, and problem solving. The goal of cognitive science, stated simply, is to understand how the mind works. Cognitive science is an inherently interdisciplinary endeavor, drawing on tools and ideas from fields such as psychology, computer science, linguistics, philosophy, economics, and neuroscience. Approaches include empirical studies of the ontogenetic and phylogenetic development of cognitive abilities, experimental work on cognitive processing in adults, attempts to understand perception and cognition based on patterns of breakdown in pathology, computational and robotic research that strives to simulate aspects of cognition and behavior, neuroscientific investigations of the neural bases of cognition using neural recording and brain scanning, and the development of philosophical theories of the nature of mind.

PREREQUISITE

An introductory survey course, CGSC 110, is normally taken by the end of the fall term of the sophomore year and prior to admission to the major.

REQUIREMENTS OF THE MAJOR

The requirements of the major for the B.S. and B.A. degrees are the same, except for the skills requirement and the senior requirement. Fourteen term courses, for a total of thirteen and one half course credits, are required for the major, including the introductory course and the senior requirement. Each major program must include the elements described below. The particular selection of courses must be approved by the director of undergraduate studies (DUS) in order to assure overall coherence. No course may be used to fulfill more than one requirement for the major.

Breadth requirement A breadth requirement introduces students to the subfields of cognitive science. Each major is required to take a course from four of the following six areas:

1. Computer science: CPSC 201
2. Economics and decision making: ECON 159
3. Linguistics: LING 110, 116, 217, 130, 232, 253
4. Neuroscience: CGSC 201, MCDB 320, PSYC 160, 270
5. Philosophy: PHIL 126, 182, 269, 270, 271
6. Psychology: PSYC 110, 140, 139

Depth requirement Students fulfill a depth requirement by completing six courses that focus on a specific topic or area in cognitive science. The depth courses must be chosen from at least two disciplines, and are typically drawn from the six cognitive science subfields. It may be possible to draw depth courses from other fields when necessary to explore the student's focal topic, in consultation with the DUS. All six depth courses must be at the intermediate or advanced level; for most disciplines, courses numbered

300 or above fulfill the requirement. With permission of the DUS, up to two directed reading or research courses may count toward the depth requirement.

Skills requirement Because formal techniques are fundamental to cognitive science, one skills course is required, preferably prior to the senior year. Courses that fulfill the skills requirement for the B.A. include CPSC 112, 202, LING 224, PSYC 200, and 270. Other courses may fulfill this requirement with permission of the DUS. The skills requirement for the B.S. is fulfilled by PSYC 200 or another course with permission of the DUS.

Junior colloquium In the junior year, students are required to take CGSC 395, a half-credit colloquium in which majors discuss current issues and research in cognitive science and select a senior essay topic.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the requirements of the major, except with permission of the DUS.

SENIOR REQUIREMENT

In the senior year, students take CGSC 491, a full-credit capstone course in which the senior essay is written. Students in the course meet regularly with one another and with the faculty to discuss current work in cognitive science and their own developing research projects. Students must take this course during their last spring term at Yale. If spring is not the student's final term, (e.g., a planned December graduation date), then it is possible to attend the class and complete some of the assignments, but not turn in the finished thesis until November. In this case, a grade of INC will be given for the Spring term. (Unlike other incomplete grades at Yale, an incomplete for a thesis does not expire.)

B.S. degree program The B.S. degree is typically awarded to students who conduct empirical research as part of their senior requirement. This normally includes designing an experiment and collecting and analyzing data.

B.A. degree program The B.A. degree is typically awarded to students who conduct a nonempirical senior essay. There are no restrictions on the research format for the B.A.

ADVISING AND APPLICATION TO THE MAJOR

Students may apply to enter the major at any point after the first year. Applications must be made in writing to the DUS. Applications must include (1) an official or unofficial transcript of work at Yale, (2) a brief statement of purpose, which indicates academic interests and expected focus within the areas of the Cognitive Science major, and (3) a list of the six upper-level courses that the student plans to take as part of the research focus. Application forms and answers to frequently asked questions are available on the program's website.

Roadmap See visual roadmap of the requirements.

REQUIREMENTS OF THE MAJOR

Prerequisite CGSC 110

Number of courses 14 term courses, for a total of 13.5 course credits (incl prereq and senior req)

Specific course required CGSC 395

Distribution of courses 1 course each in 4 of 6 subfields, as specified for breadth req; 6 courses in a specific topic or area, as specified for depth req; 1 skills course, as specified

Senior requirement *B.S.* – empirical research and senior essay in CGSC 491; *B.A.* – nonempirical senior essay in CGSC 491

FACULTY ASSOCIATED WITH THE PROGRAM IN COGNITIVE SCIENCE

Professors Woo-kyoung Ahn (*Psychology*), Stephen Anderson (*Emeritus*), Amy Arnsten (*School of Medicine*), John Bargh (*Psychology*), Paul Bloom (*Psychology*), Hal Blumenfeld (*School of Medicine*), Marvin Chun (*Psychology*), Michael Della Rocca (*Philosophy*), Ravi Dhar (*School of Management*), Julie Dorsey (*Computer Science*), Robert Frank (*Linguistics*), Shane Frederick (*School of Management*), David Gelernter (*Computer Science*), Tamar Gendler (*Philosophy*), Laurence Horn (*Emeritus*) (*Linguistics*), Marcia Johnson (*Emeritus*), Dan Kahan (*Law School*), Frank Keil (*Psychology, Linguistics*), Joshua Knobe (*Philosophy*), Daeyeol Lee (*School of Medicine*), Gregory McCarthy (*Psychology*), Drew McDermott (*Computer Science*), Nathan Novemsky (*School of Management, Psychology*), Kenneth Pugh (*School of Medicine*), Ian Quinn (*Music*), Holly Rushmeier (*Computer Science*), Laurie Santos (*Psychology*), Brian Scassellati (*Computer Science, Mechanical Engineering*), Brian Scholl (*Chair*) (*Psychology*), Sun-Joo Shin (*Philosophy*), Jason Stanley (*Philosophy*), Zoltán Szabó (*Philosophy*), Nick Turk-Browne (*Psychology*), Tom Tyler (*Law School*), Fred Volkmar (*School of Medicine*), David Watts (*Anthropology*), Karen Wynn (*Emeritus*) (*Psychology*), Gideon Yaffe (*Law School*), Raffaella Zanuttini (*Linguistics*), Steven Zucker (*Computer Science, Biomedical Engineering*)

Associate Professors Daylian Cain (*School of Management*), James McPartland (*Child Study Center*), Maria Piñango (*Linguistics*)

Assistant Professors Ryan Bennett (*Linguistics*), Steve Chang (*Psychology*), Philip Corlett (*Psychiatry*), Molly Crockett (*Psychology*), Yarrow Dunham (*Psychology*), Julian Jara-Ettinger (*Psychology*), Hedy Kober (*School of Medicine*), George Newman (*School of Management*)

Introductory Courses

CGSC 110a / PSYC 130a, Introduction to Cognitive Science Natalia Córdova Sánchez
An introduction to the interdisciplinary study of how the mind works. Discussion of tools, theories, and assumptions from psychology, computer science, neuroscience, linguistics, and philosophy. so

CGSC 175a, The Mystery of Sleep Suman Baddam and Meir Kryger
The role in which sleep and circadian rhythms affect attention, cognition, and memory through multidisciplinary consideration of neurobiology, epidemiology, and humanities. Psychological aspects of sleep; sleep disorders; sleep deprivation; and the history of sleep in philosophy, literature, and art. This course is not open to students previously enrolled in CSPC 350, CSMC 370, or CSYC 390. sc

CGSC 216b / LING 116b / PSYC 116b, Cognitive Science of Language Robert Frank
The study of language from the perspective of cognitive science. Exploration of mental structures that underlie the human ability to learn and process language, drawing on studies of normal and atypical language development and processing,

brain imaging, neuropsychology, and computational modeling. Innate linguistic structure vs. determination by experience and culture; the relation between linguistic and nonlinguistic cognition in the domains of decision making, social cognition, and musical cognition; the degree to which language shapes perceptions of color, number, space, and gender. SO

CGSC 277b / AFAM 198b / EDST 177b / EP&E 494b / PHIL 177b, Propaganda, Ideology, and Democracy Jason Stanley

Historical, philosophical, psychological, and linguistic introduction to the issues and challenges that propaganda raises for liberal democracy. How propaganda can work to undermine democracy; ways in which schools and the press are implicated; the use of propaganda by social movements to address democracy's deficiencies; the legitimacy of propaganda in cases of political crisis. HU

Advanced Courses

* **CGSC 313b / PHIL 305b / PSYC 313b, Philosophy for Psychologists** Joshua Knobe
Introduction to frameworks developed within philosophy that have applications in psychological research. Principal topics include the self, causation, free will, and morality. Recommended preparation: a course in philosophy or psychology. HU, SO

CGSC 352a / NSCI 352a / PSYC 352a, Arrested or Adaptive Development of the Adolescent Brain BJ Casey

Study of empirical and theoretical accounts of adolescent-specific changes in the brain and in behavior that relate to the development of self control. Discussions will focus on adaptive and arrested adolescent brain development in the context of relevant legal, social, and health policy issues. SC

* **CGSC 390b, Junior Seminar in Cognitive Science** Natalia Córdova Sánchez
Discussion of historically important papers in cognitive science. Topics are varied and reflect student interests. Some attention to planning for the senior project. Intended for juniors in the Cognitive Science major.

* **CGSC 419b / NSCI 419b / PSYC 419b, Topics in Brain Development, Law, and Policy** BJ Casey

Healthy development is a fundamental right of the individual, regardless of race, ethnicity, socioeconomic status, or gender. Youth require special protections of their rights due to vulnerabilities related to their physical and mental immaturity. These rights include, not only protections, but opportunities for building the cognitive, emotional, and social skills necessary for becoming a healthy adult and a contributing member of society. This seminar examines the extent to which legal policies and practices in the treatment of youths are consistent with scientific knowledge on psychological and brain development. Each class discusses one or more legal cases highlighted in the context of brain and psychological science and current laws and policies. Prerequisite: PSYC 110 and PSYC 160 preferred. SO

* **CGSC 420b / NSCI 440b / PSYC 420b, Topics in Clinical Neuroscience** Avram Holmes

An overview and examination of the neuroscience of psychiatric illness. We focus on cutting-edge research in humans and animals aimed at understanding the biological mechanisms that underlie psychiatric illness. Although these questions date back to early philosophical texts, only recently have experimental psychologists and

neuroscientists began to explore this vast and exciting domain of study. We discuss the evolutionary and developmental origins of individual differences in human personality, measurement issues, fundamental dimensions of psychopathology, stability/plasticity, heritability, and implications therapeutic interventions as well as the associated broader implications for public policy. A major focus is on the neurobiology of fear and anxiety, including brain circuits, molecular genetic pathways, and epigenetics. A secondary focus is on differences in behavior and biology that confer risk for the development of depression and addiction, including the biological systems involved in hedonic pleasure, motivated goal pursuit, and the regulation of impulses in the face of everyday temptation. Students should have some background in psychology; PSYC 110 and PSYC 160 preferred. SO

* **CGSC 426a / EP&E 490a / PHIL 426a / PSYC 422a, The Cognitive Science of Morality** Joshua Knobe

Introduction to the emerging field of moral cognition. Focus on questions about the philosophical significance of psychological findings. Topics include the role of emotion in moral judgment; the significance of character traits in virtue ethics and personality psychology; the reliability of intuitions and the psychological processes that underlie them. HU

Courses for Majors

* **CGSC 395a, Junior Colloquium in Cognitive Science** Natalia Córdova Sánchez
Survey of contemporary issues and current research in cognitive science. By the end of the term, students select a research topic for the senior essay. Enrollment limited to Cognitive Science majors. ½ Course cr

* **CGSC 471a and CGSC 472b, Directed Research in Cognitive Science** Joshua Knobe
Research projects for qualified students. The student must be supervised by a member of the Cognitive Science faculty, who sets the requirements and directs the research. To register, a student must submit a written plan of study to the director of undergraduate studies and the faculty supervisor. The normal minimum requirement is a written report of the completed research, but individual faculty members may set alternative equivalent requirements. Only one term may be offered toward the major, with permission of the director of undergraduate studies; two terms may be offered toward the bachelor's degree.

* **CGSC 473a and CGSC 474b, Directed Reading in Cognitive Science** Joshua Knobe
Individual study for qualified students who wish to investigate an area of cognitive science not covered in regular courses. The student must be supervised by a member of the Cognitive Science faculty, who sets the requirements and meets regularly with the student. To register, a student must submit a written plan of study to the director of undergraduate studies and the faculty supervisor. The normal minimum requirement is a term paper, but individual faculty members may set alternative equivalent requirements. Only one term may be offered toward the major, with permission of the director of undergraduate studies; two terms may be offered toward the bachelor's degree.

* **CGSC 491b, Senior Project** Natalia Córdova Sánchez
A research colloquium leading to the completion of the senior essay. Students attend regular colloquium presentations. Enrollment limited to Cognitive Science majors.

Related Courses That May Count toward the Major

* **CHLD 350b / EDST 350b / PSYC 350b, Autism and Related Disorders** Fred Volkmar and James McPartland

Weekly seminar focusing on autism and related disorders of socialization. A series of lectures on topics in etiology, diagnosis and assessment, treatment and advocacy, and social neuroscience methods; topics cover infancy through adulthood. Supervised experience in the form of placement in a school, residence, or treatment setting for individuals with autism spectrum disorders. Details about admission to the course are explained at the first course meeting. Prerequisite: an introductory psychology course. SO

CPSC 112b, Introduction to Programming Benedict Brown

Development on the computer of programming skills, problem-solving methods, and selected applications. No previous experience with computers necessary. QR

CPSC 201a or b, Introduction to Computer Science Staff

Introduction to the concepts, techniques, and applications of computer science. Topics include computer systems (the design of computers and their languages); theoretical foundations of computing (computability, complexity, algorithm design); and artificial intelligence (the organization of knowledge and its representation for efficient search). Examples stress the importance of different problem-solving methods. After CPSC 112 or equivalent. QR

CPSC 202a, Mathematical Tools for Computer Science Dana Angluin

Introduction to formal methods for reasoning and to mathematical techniques basic to computer science. Topics include propositional logic, discrete mathematics, and linear algebra. Emphasis on applications to computer science: recurrences, sorting, graph traversal, Gaussian elimination. QR

[**CPSC 471, Advanced Topics in Artificial Intelligence**]

CPSC 475a / BENG 475a / EENG 475a, Computational Vision and Biological Perception Steven Zucker

An overview of computational vision with a biological emphasis. Suitable as an introduction to biological perception for computer science and engineering students, as well as an introduction to computational vision for mathematics, psychology, and physiology students. Prerequisite: CPSC 112 and MATH 120, or with permission of instructor. QR, SC RP

[**CPSC 476, Advanced Computational Vision**]

ECON 159b, Game Theory Marina Halac

An introduction to game theory and strategic thinking. Ideas such as dominance, backward induction, Nash equilibrium, evolutionary stability, commitment, credibility, asymmetric information, adverse selection, and signaling are applied to games played in class and to examples drawn from economics, politics, the movies, and elsewhere. After introductory microeconomics. No prior knowledge of game theory assumed. QR, SO

LING 110a, Language: Introduction to Linguistics Jason Shaw

The goals and methods of linguistics. Basic concepts in phonology, morphology, syntax, and semantics. Techniques of linguistic analysis and construction of linguistic

models. Trends in modern linguistics. The relation of linguistics to psychology, logic, and other disciplines. SO

*** LING 212a, Linguistic Change** Claire Bower

How languages change, how we study change, and how language relates to other areas of society. This seminar is taught through readings chosen by instructor and students, on topics of interest. Prerequisite: LING 112 or equivalent. SO

LING 217a / EDST 237a / PSYC 317a, Language and Mind Maria Piñango

The structure of linguistic knowledge and how it is used during communication. The principles that guide the acquisition of this system by children learning their first language, by children learning language in unusual circumstances (heritage speakers, sign languages) and adults learning a second language, bilingual speakers. The processing of language in real-time. Psychological traits that impact language learning and language use. SO RP

LING 275b, Pragmatics Laurence Horn

Context-dependent aspects of meaning and inference. Speech act theory, presupposition, implicature. Role of pragmatics in the lexicon and in meaning change. The semantics-pragmatics distinction from different perspectives; the position of pragmatics in linguistic theory. SO RP

*** LING 232a, Introduction to Phonological Analysis** Natalie Weber

The structure of sound systems in particular languages. Phonemic and morphophonemic analysis, distinctive-feature theory, formulation of rules, and problems of rule interpretation. Emphasis on problem solving. Prerequisite: LING 220, or a grade of B or above in LING 110. SO

*** LING 235b, Phonological Theory** Natalie Weber

Topics in the architecture of a theory of sound structure. Motivations for replacing a system of ordered rules with a system of ranked constraints. Optimality theory: universals, violability, constraint types and their interactions. Interaction of phonology and morphology, as well as the relationship of phonological theory to language acquisition and learnability. Opacity, lexical phonology, and serial versions of optimality theory. Prerequisite: LING 232 or permission of instructor. SO RP

LING 253a, Syntax I Raffaella Zanuttini

If you knew all the words of a language, would you be able to speak that language? No, because you'd still need to know how to put the words together to form all and only the grammatical sentences of that language. This course focuses on the principles of our mental grammar that determine how words are put together to form sentences. Some of these principles are shared by all languages, some differ from language to language. The interplay of the principles that are shared and those that are distinct allows us to understand how languages can be very similar and yet also very different at the same time. This course is mainly an introduction to syntactic theory: it introduces the questions that the field asks, the methodology it employs, some of the main generalizations that have been drawn and results that have been achieved. Secondly, this course is also an introduction to scientific theorizing: what it means to construct a scientific theory, how to test it, and how to choose among competing theories. SO

LING 254b, Syntax II Jim Wood

Recent developments in the principles and parameters approach to syntactic theory. In-depth exploration of theoretical and empirical issues in long-distance dependencies

(island effects, dependency types, movement vs. binding), the character of syntactic structure (constituency, thematic mapping, functional categories), and the architecture of grammatical derivations (logical form, operations for structure building, anaphora). Prerequisite: LING 253. SO

LING 263a, Semantics I Veneeta Dayal

Introduction to truth-conditional compositional semantics. Set theory, first- and higher-order logic, and the lambda calculus as they relate to the study of natural language meaning. Some attention to analyzing the meanings of tense/aspect markers, adverbs, and modals. QR, SO

MCDB 320a / NSCI 320a, Neurobiology Haig Keshishian and Paul Forscher

The excitability of the nerve cell membrane as a starting point for the study of molecular, cellular, and systems-level mechanisms underlying the generation and control of behavior. Prerequisites: year of college-level chemistry; a course in physics is strongly recommended. SC

PHIL 126b, Introduction to Modern Philosophy from Descartes to Kant Kenneth Winkler

An introduction to major figures in the history of modern philosophy, with critical reading of works by Descartes, Malabranche, Spinoza, Leibniz, Locke, Berkeley, Hume, and Kant. Intended to be taken in conjunction with PHIL 125, although PHIL 125 is not a prerequisite. HU

PHIL 267b, Mathematical Logic Sun-Joo Shin

An introduction to the metatheory of first-order logic, up to and including the completeness theorem for the first-order calculus. Introduction to the basic concepts of set theory. Prerequisite: PHIL 115 or permission of instructor. QR

PHIL 269b, The Philosophy of Science Mark Maxwell

Central questions about the nature of scientific theory and practice. Factors that make a discipline a science; how and why scientific theories change over time; interpreting probabilistic claims in science; whether simpler theories are more likely to be true; the laws of nature; whether physics has a special status compared to other sciences; the legitimacy of adaptationist thinking in evolutionary biology. HU

PHIL 270b, Epistemology Keith DeRose

Introduction to current topics in the theory of knowledge. The analysis of knowledge, justified belief, rationality, certainty, and evidence. HU

PHIL 271b / LING 271b, Philosophy of Language Jason Stanley

An introduction to contemporary philosophy of language, organized around four broad topics: meaning, reference, context, and communication. Introduction to the use of logical notation. HU

PSYC 110a or b, Introduction to Psychology Staff

A survey of major psychological approaches to the biological, cognitive, and social bases of behavior. SO

[**PSYC 140, Developmental Psychology**]

PSYC 150b / EDST 160b, Social Psychology Maria Gendron

Theories, methodology, and applications of social psychology. Core topics include the self, social cognition/social perception, attitudes and persuasion, group processes,

conformity, human conflict and aggression, prejudice, prosocial behavior, and emotion. SO

PSYC 160a / NSCI 160a, The Human Brain Gregory McCarthy

Introduction to the neural bases of human psychological function, including social, cognitive, and affective processing. Preparation for more advanced courses in cognitive and social neuroscience. Topics include memory, reward processing, neuroeconomics, individual differences, emotion, social inferences, and clinical disorders. Neuroanatomy, neurophysiology, and neuropharmacology are also introduced. SC

PSYC 179a, Thinking Woo-kyoung Ahn

A survey of psychological studies on thinking and reasoning, with discussion of ways to improve thinking skills. Topics include judgments and decision making, causal learning, logical reasoning, problem solving, creativity, intelligence, moral reasoning, and language and thought. SO

PSYC 200b, Statistics Staff

Measures of central tendency, variability, association, and the application of probability concepts in determining the significance of research findings. QR

[**PSYC 303, Social Neuroscience**]

PSYC 335b / NSCI 340b, Cognitive Neuroscience Steve Wohn Chang

This course covers how cognition is made by the brain. Students learn brain mechanisms underlying human cognition, including making decisions, paying attention, regulating emotion, remembering events, as well as understanding others. The course discusses both established and newly emerging findings based on several landmark experiments in both humans and animals. During this process, students are also introduced to cutting-edge techniques in cognitive neuroscience for studying human cognition. Prerequisite: PSYC 160 or specific chapter readings from the instructor. SC

College Seminars

The Residential College Seminar program is designed to enhance the educational life of the residential colleges by offering innovative and interdisciplinary courses, for credit, that fall outside departmental structures.

The faculty for the seminar program is drawn from many backgrounds, including Yale faculty, both from Yale College and from other schools of the University; faculty from other institutions; and individuals from walks of life outside the university setting. Residential college seminars for the fall and spring terms are described on the Residential College Seminar Program website and in Yale Course Search. The online listings contain course titles, descriptions, and prerequisites. Course syllabuses are available on Canvas @ Yale.

Students apply to college seminars before classes begin through an online tool on the program website or through a link in the online course description. Students may apply to a maximum of two college seminars in a given term; choices are not ranked by order of preference. Students may enroll in no more than four college seminars total during their time at Yale. Auditing is not permitted in college seminars.

Computer Science

Director of undergraduate studies: Y. Richard Yang (yang.r.yang@yale.edu), AKW 208A, 432-6400 [F]; James Aspnes (james.aspnes@yale.edu), AKW 401, 432-1232 [Sp]; cpsc.yale.edu

The Department of Computer Science offers both B.S. and B.A. degree programs, as well as four combined majors in cooperation with other departments: Electrical Engineering and Computer Science, Computer Science and Economics, Computer Science and Mathematics, and Computer Science and Psychology. Each major program not only provides a solid technical education but also allows students either to take a broad range of courses in other disciplines or to complete the requirements of a second major.

The Computer Science and combined major programs share a common core of five computer science courses. The first is CPSC 201, a survey that demonstrates the breadth and depth of the field to students who have taken the equivalent of an introductory programming course. The remaining core courses cover discrete mathematics, data structures, systems programming and computer architecture, and algorithm analysis and design. Together these courses include the material that every major should know.

The core courses are supplemented by electives (and, for the combined majors, core courses in the other discipline) that offer great flexibility in tailoring a program to each student's interests. The capstone is the senior project, through which students experience the challenges and rewards of original research under the guidance of a faculty mentor.

Prospective majors are encouraged to discuss their programs with the director of undergraduate studies (DUS) as early as possible.

INTRODUCTORY COURSES

The department offers a broad range of introductory courses to meet the needs of students with varying backgrounds and interests. Except for CPSC 200 and CPSC 201, none assumes previous knowledge of computers.

1. CPSC 100, taught jointly with Harvard University, teaches students majoring in any subject area how to program a computer and solve problems. No prior experience is required.
2. CPSC 112 teaches students majoring in any subject area how to program a computer and solve problems using the language Java. Students with previous programming experience should consider taking CPSC 201 instead.
3. CPSC 134 provides an introduction to computer music, including musical representations for computing, automated music analysis and composition, interactive systems, and virtual instrument design.
4. CPSC 150 explores how some of the key ideas in computer science have affected philosophy of mind, cognitivism, connectionism, and related areas. This humanities-style course requires a significant amount of reading and writing a paper, and satisfies the writing and the humanities and arts distributional requirements.

5. CPSC 151 studies the history of the graphical user interface in an attempt to guess its future. This course also satisfies the writing distributional requirement.
6. CPSC 183 explores the myriad ways that law and technology intersect, with a special focus on the role of cyberspace. This course satisfies the social science distributional requirement.
7. CPSC 200, intended as a survey course for non-majors, focuses on practical applications of computing technology while examining topics including computer hardware, computer software, and related issues such as security and software engineering.
8. CPSC 201 surveys the field of computer science, including systems (computers and their languages) and theory (algorithms, complexity, and computability). Students with sufficient programming experience may elect CPSC 201 without taking CPSC 112. (These courses meet at the same time so that students are easily able to change levels if necessary.)
9. CPSC 202 presents the formal methods of reasoning and the concepts of discrete mathematics and linear algebra used in computer science and related disciplines.

REQUIREMENTS OF THE MAJOR

The B.S. and the B.A. degree programs have the same required five core courses: CPSC 201; CPSC 202 or MATH 244; CPSC 223; CPSC 323; and CPSC 365 or 366. CPSC 480 and 490 may not be counted toward these core courses.

B.S. degree program The B.S. degree program requires a total of twelve courses, six additional intermediate or advanced courses in Computer Science and the senior requirement.

B.A. degree program The B.A. degree program requires a total of ten courses, four additional intermediate or advanced course in Computer Science and the senior requirement.

Combined B.S./M.S. degree Exceptionally able and well-prepared students may complete a course of study leading to the simultaneous award of the B.S. and M.S. degrees after eight terms of enrollment. General eligibility requirements are described in the Academic Regulations, section K, Special Arrangements, "Simultaneous Award of the Bachelor's and Master's Degrees." Specific requirements for the combined degree in Computer Science are as follows:

1. Candidates must satisfy the Yale College requirements for the B.S. degree in Computer Science.
2. At the end of their fifth term of enrollment candidates must have earned at least nine of their Computer Science required course credits, which together with three additional Computer Science required course credits, satisfy the requirements for the B.S. in Computer Science. Candidates must also have achieved A grades in at least three quarters of these courses.
3. Candidates must also complete eight graduate courses from the approved list, up to two of which may, with the permission of the director of undergraduate studies (DUS) and the director of graduate studies, also be applied toward completion of the B.S. degree. At most, one of these eight courses may be CPSC 690, 691, or 692. All eight graduate courses must be completed in the final

four terms of enrollment, and at least six of them must be completed in the final three terms of enrollment.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the major. All courses in the major must be taken for a letter grade.

Roadmap See visual roadmap of the requirements.

SENIOR REQUIREMENT

In the senior year students must take CPSC 490, an independent project course in which students select an adviser to guide them in research in a subfield of computer science. With permission of the DUS, students may enroll in 490 more than once or before their senior year.

ADVISING

All Computer Science majors in the sophomore, junior, and senior years should have their programs approved by the DUS. Students majoring in Computer Science are advised to complete CPSC 201 and 223 by the end of the sophomore year.

Electives The Computer Science department encourages interdisciplinary study in which computer science plays a major role. Advanced courses in other departments that involve concepts from computer science and are relevant to an individual program may, with permission of the DUS, be counted toward the requirements.

Students considering graduate study in computer science are advised to take CPSC 421 and 422, as well as courses covering the breadth of computer science, including programming languages and systems, artificial intelligence, scientific computing, and theoretical computer science.

Students interested in using computers to solve scientific and engineering problems are advised to take CPSC 440 as well as computational courses offered in Applied Mathematics and in Engineering and Applied Science.

The core mathematical background necessary to complete the Computer Science major is provided in CPSC 202. However, many advanced courses in graphics, computer vision, neural networks, and numerical analysis assume additional knowledge of linear algebra and calculus. Students who plan to take such courses as electives and who are unsure whether they have the appropriate mathematical background are encouraged to take MATH 222 or 225, and MATH 120.

Typical programs For students who already know how to program, typical B.S. programs starting in the first and sophomore years are indicated below. For typical B.A. programs, two of the electives would be omitted.

First-Year	Sophomore	Junior	Senior
CPSC 201	CPSC 202	Two electives	CPSC 490
	CPSC 323		
CPSC 223	CPSC 365 or 366	Two electives	One elective
	One elective		
	Sophomore	Junior	Senior
		One elective	
	CPSC 223	CPSC 365 or 366	Two electives
	CPSC 201	CPSC 323	CPSC 490
	CPSC 202	One elective	Two electives

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses *B.S.* – 12 term courses taken for letter grades (incl senior project);

B.A. – 10 term courses taken for letter grades (incl senior project)

Specific courses required *B.S. and B.A.* – CPSC 201; CPSC 202 or MATH 244;

CPSC 223; CPSC 323; and CPSC 365 or 366

Distribution of courses *B.S.* – 6 addtl intermediate or advanced Comp Sci courses;

B.A. – four addtl intermediate or advanced Comp Sci courses

Substitution permitted Advanced courses in other depts, with DUS permission

Senior requirement Senior project (CPSC 490)

FACULTY OF THE DEPARTMENT OF COMPUTER SCIENCE

Professors Dana Angluin, James Aspnes, Dirk Bergemann, *Ronald Coifman, *Julie Dorsey, Stanley Eisenstat, Joan Feigenbaum, Michael Fischer, David Gelernter, Mark Gerstein, *John Lafferty, *Rajit Manohar, *Drew McDermott (*Emeritus*), Dragomir Radev, Vladimir Rokhlin, †Holly Rushmeier, Brian Scassellati, Martin Schultz (*Emeritus*), Zhong Shao (*Chair*), Avi Silberschatz, Daniel Spielman, Leandros Tassiulas, *Y. Richard Yang, †Steven Zucker

Associate Professor Mahesh Balakrishnan

Assistant Professors Wenjun Hu, *Julian Jara-Ettinger, *Amin Karbasi, *Smita Krishnaswamy, *Sahand Negahban, *Ruzica Piskac, Mariana Raykova, Jakub Szefer, *Marynel Vasquez

Senior Research Scientists Robert Bjornson, Andrew Sherman

Senior Lecturer Stephen Slade

Lecturers Benedict Brown, James Glenn, Kyle Jensen, *Natalie Melo, Scott Petersen, Brad Rosen, Xiyin Tang

*A secondary appointment with primary affiliation in another department or school.

†A joint appointment with primary affiliation in another department or school.

For a complete list of Computer Science Department personnel, visit cpsc/yale.edu.

Introductory Courses

* CPSC 035b / MUSI 035b, **Twenty-First Century Electronic and Computer Music Techniques** Scott Petersen

Exploration of twenty-first century electronic and computer music through the diverse subjects and issues at the intersection of technology and new music. How computers have changed and challenged the analysis, composition, production, and appreciation of music over the last fifty years. Knowledge of basic music theory and the ability to read Western musical notation is assumed. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program.

CPSC 100a / CPSC S100, **Introduction to Computing and Programming** Benedict Brown

Introduction to the intellectual enterprises of computer science and to the art of programming. Students learn how to think algorithmically and solve problems efficiently. Topics include abstraction, algorithms, data structures, encapsulation, resource management, security, software engineering, and web development. Languages include C, Python, SQL, and JavaScript, plus CSS and HTML. Problem sets inspired by real-world domains of biology, cryptography, finance, forensics, and gaming. See CS50's website, <https://cs50.yale.edu>, for additional information. No previous programming experience required. Open to students of all levels and majors.

QR

CPSC 112b, **Introduction to Programming** Benedict Brown

Development on the computer of programming skills, problem-solving methods, and selected applications. No previous experience with computers necessary. QR

* CPSC 150a, **Computer Science and the Modern Intellectual Agenda** David Gelernter

Introduction to the basic ideas of computer science (computability, algorithm, virtual machine, symbol processing system), and of several ongoing relationships between computer science and other fields, particularly philosophy of mind. No previous experience with computers necessary. Enrollment limited to 25. WR, HU

CPSC 183a, **Law, Technology, and Culture** Brad Rosen

An exploration of the myriad ways in which law and technology intersect, with a special focus on the role of cyberspace. Topics include digital copyright, free speech, privacy and anonymity, information security, innovation, online communities, the impact of technology on society, and emerging trends. No previous experience with computers or law necessary. SO

* CPSC 185b, **Control, Privacy, and Technology** Brad Rosen

The evolution of various legal doctrines with and around technological development. Topics include criminal law, privacy, search and seizure, digital rights, and the implications of technologically permitted methods of control on the law. Special attention to case law and policy. After CPSC 183. WR, SO

CPSC 200b, **Introduction to Information Systems** Staff

The real-world artifacts and implementations that comprise the vital computational organisms that populate our world. Hardware and software and the related issues of security, privacy, regulation, and software engineering. Examples stress practical

applications of technology, as well as limitations and societal issues. After CPSC 100 or 112 or equivalent. QR

CPSC 201a or b, Introduction to Computer Science Staff

Introduction to the concepts, techniques, and applications of computer science. Topics include computer systems (the design of computers and their languages); theoretical foundations of computing (computability, complexity, algorithm design); and artificial intelligence (the organization of knowledge and its representation for efficient search). Examples stress the importance of different problem-solving methods. After CPSC 112 or equivalent. QR

CPSC 202a, Mathematical Tools for Computer Science Dana Angluin

Introduction to formal methods for reasoning and to mathematical techniques basic to computer science. Topics include propositional logic, discrete mathematics, and linear algebra. Emphasis on applications to computer science: recurrences, sorting, graph traversal, Gaussian elimination. QR

CPSC 223a or b, Data Structures and Programming Techniques Staff

Topics include programming in C; data structures (arrays, stacks, queues, lists, trees, heaps, graphs); sorting and searching; storage allocation and management; data abstraction; programming style; testing and debugging; writing efficient programs. After CPSC 201 or equivalent. QR RP

CPSC 235b / EENG 245b, Self-Driving Cars: Theory and Practice Man-Ki Yoon

This course explores the theory and practice of building self-driving cars using advanced computing technologies. Topics include embedded system programming, sensor fusion, control theory, and introductory planning and navigation techniques using machine learning and computer vision. Students work in small teams to design and build miniaturized self-driving cars that autonomously navigate an indoor track that resembles real road environments. The final project involves driving competitions and project report/presentation of their work. Prerequisite: CPSC 112, 201, 223, or equivalent. Instructor's permission is required to waive the prerequisites. Enrollment limited to 18. QR

CPSC 257a, Information Security in the Real World Staff

Introduction to information security, the practice of protecting information from unauthorized actions, in the context of computer systems. Topics include current security-related issues, basic adversarial models and threats to computer systems, potential defenses, security tools, and common security breaches and their wider impacts. Prerequisite: CPSC 100, 112, or equivalent programming experience, or with permission of instructor. QR

CPSC 276a, Introduction to Web Application for the Digital Humanities Benedict Brown

Introduction to applications of computer and data science in the humanities, including web technologies, visualization, and database design. Students work in teams to develop a variety of applications proposed by faculty and staff from the Digital Humanities Lab, the Institute for the Preservation of Cultural Heritage, and the Computer Science department. Meets with CPSC 376. Students may earn credit for CPSC 276 or 376; not both. Prerequisite: CPSC 110, CPSC 112, equivalent programming experience, or permission of the instructor. QR

* **CPSC 290a or b, Directed Research** Staff

Individual research. Requires a faculty supervisor and the permission of the director of undergraduate studies. May be taken more than once for credit.

Intermediate Courses

CPSC 310b, Technology, Power, and Security: Political Challenges of the Computer

Age Joan Feigenbaum

Twenty-first century societies are faced with both threats and opportunities that combine sophisticated computation with politics and international relations in critical ways. Examples include cyber warfare; cyber espionage; cyber crime; the role of social media in democratic self-governance, authoritarian control, and election "hacking"; cryptocurrencies; and mass surveillance. This course examines the political challenges wrought by massive increases in the power of computational and communication technologies and the potential for citizens and governments to harness those technologies to solve problems. It is co-taught by one faculty member in computer science and one in political science. Programming experience and some knowledge of basic computer science is required. Meets with CPSC 210/PLSC 369. Students may earn credit for CPSC 210/PLSC 369 or for CPSC 310; not for both. Prerequisite: CPSC 223 or the equivalent. QR, SO

CPSC 323a or b, Introduction to Systems Programming and Computer Organization

Staff

Machine architecture and computer organization, systems programming in a high-level language, issues in operating systems, software engineering, prototyping in scripting languages. After CPSC 223. QR RP

CPSC 334a, Creative Embedded Systems Scott Petersen

Ubiquitous computing is creating new canvases and opportunities for creative ideas. This class explores the use of microprocessors, distributed sensor networks, IoT, and intermedia systems for the purposes of creative expression. The course is delivered in a mixed lecture and lab format that introduces the fundamental concepts and theory behind embedded systems as well as issues particular to their creative employment. The key objective of the course is for students to conceive of and implement creative uses of computation. To this end, skills to be obtained during the course are as follows: (1) appreciate the current efforts and motivation to push the limitations of computation for creative expression, both in new application and new foundational research; (2) weigh factors such as cost, power, processing, memory, I/O capabilities, and networking capabilities when choosing a set of embedded devices and sensors; (3) contextualize unfamiliar hardware and languages through examples, documentation, and familiar design pattern; and (4) manage communication between multiple languages, devices, and protocols. Additionally, at the end of the course students will have a portfolio of their work in the form of writing, code, video, audio, and physical artifacts. Prerequisite: CPSC 223 or equivalent or by permission of instructor. QR RP

CPSC 338b / EENG 348b, Digital Systems Staff

Development of engineering skills through the design and analysis of digital logic components and circuits. Introduction to gate-level circuit design, beginning with single gates and building up to complex systems. Hands-on experience with

circuit design using computer-aided design tools and programmable logic devices.

Recommended preparation: EENG 201b. RP

CPSC 362a / AMTH 262a / S&DS 262a, Computational Tools for Data Science Roy Lederman

Introduction to the core ideas and principles that arise in modern data analysis, bridging statistics and computer science and providing students the tools to grow and adapt as methods and techniques change. Topics include principle component analysis, independent component analysis, dictionary learning, neural networks and optimization, as well as scalable computing for large datasets. Assignments will include implementation, data analysis and theory. Students require background in linear algebra, multivariable calculus, probability and programming. Prerequisites: after or concurrently with MATH 222, 225, or 231; after or concurrently with MATH 120, 230, or ENAS 151; after or concurrently with CPSC 100, 112, or ENAS 130; after S&DS 100-108 or S&DS 230 or S&DS 241 or S&DS 242. QR

CPSC 365b / ECON 365b, Algorithms James Glenn

Paradigms for algorithmic problem solving: greedy algorithms, divide and conquer, dynamic programming, and network flow. NP completeness and approximation algorithms for NP-complete problems. Algorithms for problems from economics, scheduling, network design and navigation, geometry, biology, and optimization. Provides algorithmic background essential to further study of computer science. Either CPSC 365 or CPSC 366 may be taken for credit. Prerequisites: CPSC 202 and 223. QR

*** CPSC 366b / ECON 366b, Intensive Algorithms** Yang Cai

Mathematically sophisticated treatment of the design and analysis of algorithms and the theory of NP completeness. Algorithmic paradigms including greedy algorithms, divide and conquer, dynamic programming, network flow, approximation algorithms, and randomized algorithms. Problems drawn from the social sciences, Data Science, Computer Science, and engineering. For students with a flair for proofs and problem solving. Either CPSC 365 or CPSC 366 may be taken for credit. Prerequisites: MATH 244 and CPSC 223. QR

CPSC 367a / CPSC 467, Cryptography and Security Michael Fischer

An introduction to cryptography and information security. Cryptographic algorithms and their application to security of digital data are presented. Some topics include classical, symmetric, and public key cryptography; digital signatures; cryptographic hash functions; and pseudorandom number generation. Multiparty protocols such as zero-knowledge proofs, secret sharing, anonymous communication, and secure multiparty function evaluation are introduced. Practical applications of cryptography to secure network communication, secure password authentication, and blockchains are also covered. The emphasis is on cryptographic algorithms and protocols that can be useful in providing information security. Students interested in a more mathematical and rigorous approach to these topics should take CPSC 467 instead, or in addition to this course. This course may not be taken for credit after CPSC 467. Prerequisites: Some programming required. After CPSC 202 and 223. QR

CPSC 376a, Advanced Web Application Development in the Digital Humanities Benedict Brown

Advanced applications of computer and data science in the humanities, including web technologies, visualization, and database design. Students work in teams to develop

a variety of applications proposed by faculty and staff from the Digital Humanities Lab, the Institute for the Preservation of Cultural Heritage, and the Computer Science department. Meets with CPSC 376. Students may earn credit for CPSC 276 or 376; not both. Prerequisite: CPSC 223 or equivalent, or permission of the instructor. QR

Advanced Courses

* CPSC 421b, Compilers and Interpreters Staff

Compiler organization and implementation: lexical analysis, formal syntax specification, parsing techniques, execution environment, storage management, code generation and optimization, procedure linkage and address binding. The effect of language-design decisions on compiler construction. After CPSC 323. QR

CPSC 423b, Principles of Operating Systems Abraham Silberschatz

A survey of the underlying principles of modern operating systems. Topics include process management, memory management, storage management, protection and security, distributed systems, and virtual machines. Emphasis on fundamental concepts rather than implementation. After CPSC 323. QR

CPSC 424b, Parallel Programming Techniques Staff

Practical introduction to parallel programming, emphasizing techniques and algorithms suitable for scientific and engineering computations. Aspects of processor and machine architecture. Techniques such as multithreading, message passing, and data parallel computing using graphics processing units. Performance measurement, tuning, and debugging of parallel programs. Parallel file systems and I/O. Prerequisite: CPSC 323, or CPSC 223 and significant experience with C/C++ programming in another science, social science or engineering discipline, or permission of instructor. QR RP

[CPSC 426, Building Distributed Systems]

CPSC 427b, Object-Oriented Programming James Glenn

Object-oriented programming as a means to efficient, reliable, modular, reusable code. Use of classes, derivation, templates, name-hiding, exceptions, polymorphic functions, and other features of C++. After CPSC 223. QR

CPSC 428b, Language-Based Security Zhong Shao

Basic design and implementation of language-based approaches for increasing the security and reliability of systems software. Topics include proof-carrying code, certifying compilation, typed assembly languages, runtime checking and monitoring, high-confidence embedded systems and drivers, and language support for verification of safety and liveness properties. After CPSC 202, 323, and MATH 222, or equivalents. QR

[CPSC 430, Formal Semantics]

CPSC 431a / MUSI 428a, Computer Music: Algorithmic and Heuristic Composition

Scott Petersen

Study of the theoretical and practical fundamentals of computer-generated music, with a focus on high-level representations of music, algorithmic and heuristic composition, and programming languages for computer music generation. Theoretical concepts are supplemented with pragmatic issues expressed in a high-level programming language. Ability to read music is assumed. After CPSC 202 and 223. QR

CPSC 432b / MUSI 427b, Computer Music: Sound Representation and Synthesis

Scott Petersen

Study of the theoretical and practical fundamentals of computer-generated music, with a focus on low-level sound representation, acoustics and sound synthesis, scales and tuning systems, and programming languages for computer music generation. Theoretical concepts are supplemented with pragmatic issues expressed in a high-level programming language. Ability to read music is assumed. After CPSC 202 and 223. QR

CPSC 433a, Computer Networks Yang Yang

An introduction to the design, implementation, analysis, and evaluation of computer networks and their protocols. Topics include layered network architectures, applications, transport, congestion, routing, data link protocols, local area networks, performance analysis, multimedia networking, network security, and network management. Emphasis on protocols used in the Internet. After CPSC 323. QR

*** CPSC 434b, Topics in Networked Systems** Yang Yang

Study of networked systems such as the Internet and mobile networks which provide the major infrastructure components of an information-based society. Topics include the design principles, implementation, and practical evaluation of such systems in new settings, including cloud computing, software-defined networking, 5G, Internet of things, and vehicular networking. Concurrently with or after CPSC 323. QR

[CPSC 435, Internet-Scale Applications]

[CPSC 436, Networked Embedded Systems and Sensor Networks]

CPSC 437a, Introduction to Database Systems Abraham Silberschatz

Introduction to database systems. Data modeling. The relational model and the SQL query language. Relational database design, integrity constraints, functional dependencies, and normal forms. Object-oriented databases. Database data structures: files, B-trees, hash indexes. After CPSC 223. QR

[CPSC 438, Database System Implementation and Architectures]

[CPSC 439, Software Engineering]

CPSC 446b, Data and Information Visualization Holly Rushmeier

Visualization is a powerful tool for understanding data and concepts. This course provides an introduction to the concepts needed to build new visualization systems, rather than to use existing visualization software. Major topics are abstracting visualization tasks, using visual channels, spatial arrangements of data, navigation in visualization systems, using multiple views, and filtering and aggregating data. Case studies to be considered include a wide range of visualization types and applications in humanities, engineering, science, and social science. Prerequisite: CPSC 223.

*** CPSC 449a / EENG 422, Computer Architectures and Artificial Intelligence**

Richard Lethin

Introduction to the development of computer architectures specialized for cognitive processing, including both offline 'thinking machines' and embedded devices. The history of machines, from early conceptions in defense systems to contemporary initiatives. Instruction sets, memory systems, parallel processing, analog architectures, probabilistic architectures. Application and algorithm characteristics. Prerequisites: CPSC 100, CPSC 112, or equivalent programming experience; EENG 325, EENG 348, or equivalent circuits and digital logic experience; or permission of instructor. QR

*** CPSC 451b, The User Interface** David Gelernter

The user interface (UI) in the context of modern design, where tech has been a strong and consistent influence from the Bauhaus and U.S. industrial design of the 1920s and 1930s through the IBM-Eames design project of the 1950s to 1970s. The UI in the context of the windows-menus-mouse desktop, as developed by Alan Kay and Xerox in the 1970s and refined by Apple in the early 1980s. Students develop a detailed design and simple implementation for a UI. Prerequisite: CPSC 223 or equivalent.

CPSC 453a, Machine Learning for Biology Smita Krishnaswamy

Applications of machine learning methods in the analysis of high-throughput biological data with focus on genomic and proteomic data. Topics include methods for denoising data; non-linear dimensionality reduction for visualization and progression analysis; unsupervised clustering; and information theoretic analysis of gene regulatory and signaling networks.

CPSC 454a, Software Analysis and Verification Ruzica Piskac

Introduction to concepts, tools, and techniques used in the formal verification of software. State-of-the-art tools used for program verification; detailed insights into algorithms and paradigms on which those tools are based, including model checking, abstract interpretation, decision procedures, and SMT solvers. After CPSC 202 and 323 or equivalents. QR RP

*** CPSC 456b / EENG 451b, Wireless Technologies and the Internet of Things**

Wenjun Hu

Fundamental theory of wireless communications and its application explored against the backdrop of everyday wireless technologies such as WiFi and cellular networks. Channel fading, MIMO communication, space-time coding, opportunistic communication, OFDM and CDMA, and the evolution and improvement of technologies over time. Emphasis on the interplay between concepts and their implementation in real systems. Prerequisites: 1) Introductory courses in mathematics, engineering, or computer science covering basics of the following topics: Linux skills, Matlab programming, probability, linear algebra, and Fourier transform; 2) Or by permission of the instructor. The course material will be self-contained as much as possible. The labs and homework assignments require Linux and Matlab skills and simple statistical and matrix analysis (using built-in Matlab functions). There will be a couple of introductory labs to refresh Linux and matlab skills if needed.

[CPSC 457, Sensitive Information in a Connected World]

[CPSC 462, Graphs and Networks]

[CPSC 465, Theory of Distributed Systems]

CPSC 468b, Computational Complexity James Aspnes

Introduction to the theory of computational complexity. Basic complexity classes, including polynomial time, nondeterministic polynomial time, probabilistic polynomial time, polynomial space, logarithmic space, and nondeterministic logarithmic space. The roles of reductions, completeness, randomness, and interaction in the formal study of computation. After CPSC 365 or 366, or with permission of instructor. QR

CPSC 469a, Randomized Algorithms James Aspnes

A study of randomized algorithms from several areas: graph algorithms, algorithms in algebra, approximate counting, probabilistically checkable proofs, and matrix

algorithms. Topics include an introduction to tools from probability theory, including some inequalities such as Chernoff bounds. After CPSC 365 or 366; a solid background in probability is desirable. QR

[CPSC 471, **Advanced Topics in Artificial Intelligence**]

CPSC 472a, Intelligent Robotics Brian Scassellati

Introduction to the construction of intelligent, autonomous systems. Sensory-motor coordination and task-based perception. Implementation techniques for behavior selection and arbitration, including behavior-based design, evolutionary design, dynamical systems, and hybrid deliberative-reactive systems. Situated learning and adaptive behavior. After CPSC 201 and 202 or equivalents. May not be taken after CPSC 473. QR

* **CPSC 473b, Intelligent Robotics Laboratory** Brian Scassellati

Students work in small teams to construct novel research projects using one of a variety of robot architectures. Project topics may include human-robot interaction, adaptive intelligent behavior, active perception, humanoid robotics, and socially assistive robotics. Enrollment limited to 20. After CPSC 472. QR

CPSC 474a, Computational Intelligence for Games James Glenn

Introduction to techniques used for creating computer players for games, particularly board games. Topics include combinatorial and classical game theory, stochastic search methods, applications of neural networks, and procedural content generation. Prerequisites: CPSC 202 and CPSC 223. QR

CPSC 475a / BENG 475a / EENG 475a, Computational Vision and Biological Perception Steven Zucker

An overview of computational vision with a biological emphasis. Suitable as an introduction to biological perception for computer science and engineering students, as well as an introduction to computational vision for mathematics, psychology, and physiology students. Prerequisite: CPSC 112 and MATH 120, or with permission of instructor. QR, SC RP

[CPSC 476, **Advanced Computational Vision**]

CPSC 477b, Natural Language Processing Dragomir Radev

Linguistic, mathematical, and computational fundamentals of natural language processing (NLP). Topics include part of speech tagging, Hidden Markov models, syntax and parsing, lexical semantics, compositional semantics, machine translation, text classification, discourse, and dialogue processing. Additional topics such as sentiment analysis, text generation, and deep learning for NLP. Prerequisites: CPSC 202 and CPSC 223, or permission of instructor. QR

CPSC 478a, Computer Graphics Holly Rushmeier

Introduction to the basic concepts of two- and three-dimensional computer graphics. Topics include affine and projective transformations, clipping and windowing, visual perception, scene modeling and animation, algorithms for visible surface determination, reflection models, illumination algorithms, and color theory. After CPSC 202 and 223. QR

* **CPSC 479b, Advanced Topics in Computer Graphics** Julie Dorsey

An in-depth study of advanced algorithms and systems for rendering, modeling, and animation in computer graphics. Topics vary and may include reflectance modeling,

global illumination, subdivision surfaces, NURBS, physically-based fluids systems, and character animation. After CPSC 202 and 223. QR

* **CPSC 480a or b, Directed Reading** Staff

Individual study for qualified students who wish to investigate an area of computer science not covered in regular courses. A student must be sponsored by a faculty member who sets the requirements and meets regularly with the student. Requires a written plan of study approved by the faculty adviser and the director of undergraduate studies. May be taken more than once for credit.

* **CPSC 490a or b, Senior Project** Staff

Individual research intended to fulfill the senior requirement. Requires a faculty supervisor and the permission of the director of undergraduate studies. The student must submit a written report about the results of the project.

Computer Science and Economics

Director of undergraduate studies: Philipp Strack (philipp.strack@yale.edu)
(Economics), Rm. 27, 30 HH

Computer Science and Economics (CSEC) is an interdepartmental major for students interested in the theoretical and practical connections between computer science and economics. The Bachelor of Science in CSEC provides students with foundational knowledge of economics, computation, and data analysis, as well as hands-on experience with empirical analysis of economic data. It prepares students for professional careers that incorporate aspects of both economics and computer science and for academic careers conducting research in the overlap of the two fields. Topics in the overlap include market design, computational finance, economics of online platforms, machine learning, and social media.

PREREQUISITES

Prerequisite to this major is basic understanding of computer programming, discrete math, calculus, and economics. Grades of 4 or 5 on high-school AP computer science, statistics, calculus, microeconomics, and macroeconomics signal adequate preparation for required courses in the CSEC major. For students who have not taken these or equivalent courses in high school, the programming prerequisite may be satisfied with CPSC 100 or CPSC 112; the discrete mathematics prerequisite may be satisfied with CPSC 202 or MATH 244; the calculus prerequisite may be satisfied with MATH 112; the microeconomics prerequisite may be satisfied with ECON 110 or ECON 115; and the macroeconomics prerequisite may be satisfied with ECON 111 or ECON 116. Other courses may suffice, and students should consult the director of undergraduate studies (DUS) and their academic advisers if they are unsure whether they have the prerequisite knowledge for a particular required course.

REQUIREMENTS OF THE MAJOR

The B.S. degree program requires successful completion of fourteen term courses (not including courses taken to satisfy prerequisites) and the senior project. Nine of the fourteen courses are listed below; the remaining five courses are electives. With permission of the DUS and the academic adviser, a student may substitute a more advanced course in the same area as a required course. When a substitution is made, the advanced course counts toward the nine required courses and *not* toward the five electives.

The required courses include CPSC 201; CPSC 223; CPSC 323; CPSC 365 or 366; ECON 121 or 125; two courses in econometrics (ECON 117 and 123 or ECON 135 and 136); ECON 351; one course in the intersection of computer science and economics (e.g., CPSC 455, ECON 417, or ECON 433). With permission of the DUS, S&DS 241 and S&DS 242 may be taken instead of ECON 135.

Elective courses are essentially those courses that count as electives in the Computer Science major, the Economics major, or both. Exceptions are courses such as CPSC 455, ECON 417, and ECON 433 in the intersection of computer science and economics that count as electives in CPSC or ECON or both. At least one such course is required for CSEC, and students may not count the same course as an elective for CSEC. At least two electives must be taken in the CPSC department, and at least one must be taken in

the ECON department. With the permission of the academic adviser, a student may use as the fourth and/or fifth elective one or two courses in related departments that do not usually serve as electives in CPSC or ECON.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the major.

SENIOR REQUIREMENT

In the senior year, each student must complete CSEC 491, a one-term independent-project course that explicitly combines both techniques and subject matter from computer science and economics. A project proposal must be approved by the student's academic adviser and project adviser, and it must be signed by the DUS by the end of the third week of the term.

Distinction in the Major CSEC majors may earn Distinction in the Major if they receive grades of A or A– in at least three quarters of their courses in the major (not including courses taken to satisfy prerequisites), and their senior-project advisers determine that their senior projects are worthy of distinction.

ADVISING

Approval of course schedules Students considering the major but not yet declared should arrange to meet with the DUS during the first week of the term to ensure that their proposed course schedules are appropriate. Similarly, declared majors should meet with their academic advisers during the first week of the term to ensure that they are on track to satisfy all of the requirements of the major. Course schedules must be signed by the DUS each term, and they must be approved by an academic adviser before the DUS signs them.

Transfer credit Students who take a term abroad or take summer courses outside of Yale may petition the DUS to count at most two courses from outside Yale toward the requirements of the major. Students who take a year abroad may petition to count at most three courses. Many courses taken outside Yale do not meet the standards of the CSEC major; therefore, students should consult with their academic advisers and the DUS *before* taking such courses. Courses taken outside Yale may not be counted toward the major requirements in intermediate microeconomics, econometrics, or the intersection of computer science and economics.

REQUIREMENTS OF THE MAJOR

Prerequisites basic knowledge of programming, discrete math, calculus, microeconomics, and macroeconomics as determined by DUS and academic advisers, as indicated

Number of courses 14 term courses (not incl prereqs or senior req)

Specific courses required CPSC 201, 223, 323, 365 or 366; ECON 121 or 125; ECON 117 and 123 or ECON 135 and 136; ECON 351

Distribution of courses 1 course in intersection of CPSC and ECON, as indicated; 5 electives as indicated

Substitution permitted S&DS 241 and 242 may substitute for ECON 135 with DUS permission; a more advanced course in the same area may substitute for a required course with DUS and academic adviser permission

Senior requirement CSEC 491

Courses

CSEC 491a or b, Senior Project Philipp Strack

This one-term independent-project course explicitly combines both techniques and subject matter from computer science and economics. A project proposal must be approved by the DUS and project adviser by the end of the third week of the term in which the student is enrolled.

Computer Science and Mathematics

Directors of undergraduate studies: James Aspnes (james.aspnes@yale.edu) (Computer Science), 401 AKW, 432-1232; Yifeng Li (yifeng.liu@yale.edu) (Mathematics) DL 410; associate director of undergraduate studies: Miki Havlickova (miki.havlickova@yale.edu) (Mathematics), DL 446, 432-4682

Computer Science and Mathematics is an interdepartmental major for students who are interested in computational mathematics, the use of computers in mathematics, mathematical aspects of algorithm design and analysis, and theoretical foundations of computing.

REQUIREMENTS OF THE MAJOR

The major requires fourteen term courses as well as a senior project. Six of the fourteen courses must be in computer science: CPSC 201, 223, 323, and 365 or 366; one from CPSC 440, 462, 465, 468, or 469; and one additional advanced term course other than CPSC 480 or 490. The remaining eight courses must be in mathematics: MATH 120, either 222 or 225, 244, and five additional term courses numbered above MATH 200 other than MATH 470. MATH 230 and 231 may replace (but do not count in addition to) MATH 120 and 222 or 225.

A course must be listed with a MATH number to count toward the mathematics requirements—substitutions from other departments are not allowed.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the major.

SENIOR REQUIREMENT

The senior requirement is a project or an essay on a topic acceptable to both departments. Students typically enroll in CPSC 490 or MATH 475. An oral report on the mathematical aspects of the project must be presented to the Mathematics faculty. Permission must be obtained in writing from the director of undergraduate studies (DUS) of both departments before embarking on the project or the essay.

ADVISING

The entire program of each student majoring in Computer Science and Mathematics must be approved by the DUS in each department.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 14 term courses (not incl senior req)

Specific courses required CPSC 201, 223, 323, 365 or 366; one from CPSC 440, 462, 465, 468, or 469; MATH 120, 222 or 225, 244

Distribution of courses 5 addtl courses in math numbered above 200 (may not be MATH 470); 1 addtl advanced course in comp sci (may not be CPSC 480 or 490)

Substitution permitted MATH 230, 231 for MATH 120 and 222 or 225

Senior requirement Senior project or senior essay on topic acceptable to Comp Sci and Math depts with written approval from both DUSes; oral report to Math dept on mathematical aspects of project

Computer Science and Psychology

Directors of undergraduate studies: James Aspnes (james.aspnes@yale.edu) (Computer Science), 401 AKW, 432-1232; Jutta Joormann (jutta.joormann@yale.edu) (Psychology), 205 K, 432-0699

Computer Science and Psychology is an interdepartmental major designed for students interested in integrating work in these two fields. Each area provides tools and theories that can be applied to problems in the other. Examples of this interaction include cognitive science, artificial intelligence, and biological perception.

PREREQUISITE

The prerequisite for the major is PSYC 110, from which students who have scored 5 on the Advanced Placement test in Psychology are exempt. Beyond the prerequisite, the major requires fourteen term courses as well as a senior project.

REQUIREMENTS OF THE MAJOR

The major for the Class of 2021 and previous classes With approval from the director of undergraduate studies (DUS), the following changes to the requirements of the major may be fulfilled by students who declared their major under previous requirements.

The major for the Class of 2022 and subsequent classes Eight of the fourteen required courses must be in computer science: CPSC 201, 202, 223, 323, and 365 or 366, and three advanced computer science courses in artificial intelligence (examples of such courses are those in the range CPSC 470 through CSPC 477). MATH 244 may substitute for CPSC 202. CPSC 480 and 490 may not be counted as one of these courses.

The remaining six courses must be in psychology, including PSYC 200; at least one from PSYC 210–299; at least two Psychology courses from the social science point of view; and at least two courses from the natural science point of view. At least one of the two psychology courses from both the social science point of view and the natural science point of view must be designated as Core in the course listings. Refer to the Psychology program overview for a listing of courses that fulfill the social science and natural science requirements and a description of courses designated as Core.

With the permission of both DUSes, a course in cognitive psychology or cognitive science that is highly relevant to the major and that is not counted as one of the six courses in Psychology may substitute for one of the courses in artificial intelligence. An additional course in psychology and an examination arranged with the instructor of PSYC 200 may substitute for PSYC 200.

Credit/D/Fail No course in Computer Science taken Credit/D/Fail may be counted toward the major; no more than one course in Psychology taken Credit/D/Fail may be counted toward the major. No 200-level course in Psychology taken Credit/D/Fail may be counted.

SENIOR REQUIREMENT

Students must take either CPSC 490 or PSYC 499, and the project must be approved by the DUS in each department.

ADVISING

The entire program of each student majoring in Computer Science and Psychology must be approved by the DUS in each department.

REQUIREMENTS OF THE MAJOR

Prerequisite PSYC 110

Number of courses 14 term courses beyond prereq (not incl senior project)

Specific courses required CPSC 201, 202, 223, 323, and 365 or 366; PSYC 200

Distribution of courses 8 courses in Comp Sci, with 3 advanced AI courses; 6 courses in PSYC, incl PSYC 200; at least 1 additional course from PSYC 210–299; at least 2 from social science point of view and 2 from natural science point of view, with 1 designated Core course from each, as specified

Substitution permitted For CPSC 202, MATH 244; for 1 course in AI, 1 course in cognitive psychology or cognitive science; for PSYC 200, 1 addtl course in PSYC and exam arranged with instructor

Senior requirement CPSC 490 or PSYC 499, with project approved by DUS in each dept

Computing and the Arts

Director of undergraduate studies: Julie Dorsey (julie.dorsey@yale.edu) (Computer Science), 507 AKW, 432-4249

Computing and the Arts is an interdepartmental major designed for students who wish to integrate work in computing with work in one of five arts disciplines: architecture, art, history of art, music, or theater studies.

For students with a computing perspective, issues in these disciplines present interesting and substantive problems: how musicians use computers to compose; the limitations of current software tools used by artists; the types of analyses done by art historians; challenges in designing and using virtual sets in the theater; ways that virtual worlds might help to envision new forms of artistic expression; and lessons that can be learned from trying to create a robotic conductor or performer.

For students with an artistic perspective, computing methods offer a systematic approach to achieving their vision. A foundation in computer science allows artists to understand existing computing tools more comprehensively and to use them more effectively. Furthermore, it gives them insight into what fundamentally can and cannot be done with computers, so they can anticipate the future development of new tools for computing in their field.

PREREQUISITES

The prerequisite for all students in the major is either CPSC 100 or CPSC 112, which should be taken during the first year. There are two additional prerequisites for the Art track, ART 111 and 114. There are no additional prerequisites for the Architecture, History of Art track, or the Music track. Additional prerequisites for the Theater Studies track are THST 110 and 111. There is no required favorable review of studio work for admission to the major in any track.

REQUIREMENTS OF THE MAJOR

Twelve term courses are required beyond the prerequisites, not including the two-term senior project. Six of the courses must be in Computer Science, including CPSC 201, 202, and 223. Students are advised to complete CPSC 202 and 223 by the end of the sophomore year. MATH 244 may be substituted for CPSC 202. The six remaining courses are selected from one of the arts disciplines. Students choose a track in architecture, art, history of art, music, or theater studies. All requirements for a single track must be satisfied, as specified below.

Students in the Class of 2020 and 2021 With DUS approval, students may follow the requirements listed here that include a larger selection of computer science courses or they may follow the course requirements that were in place when they declared their major.

The Architecture track requires the following courses in addition to the Computer Science courses listed above: (1) ARCH 150, 200, 260, 262; (2) two elective courses from any of the three concentrations: Design; History, Theory, and Criticism; and Urban Studies; (3) two courses from CPSC 475, 478, or 479; and (4) one additional intermediate or advanced CPSC course (excluding CPSC 490).

The Art track requires the following courses in addition to the Computer Science courses listed above, as well as a sophomore review at the School of Art: (1) two 100-level courses beyond ART 111 and 114, such as ART 132 or 145; (2) two courses in Art at the 200 or 300 level, such as ART 285 or ART 369; (3) ART 395 or ART 301; (4) one course in Art at the 400 level, such as ART 495; (5) two courses selected from CPSC 475, 478, and 479; (6) one additional intermediate or advanced Computer Science course (excluding CPSC 490). Seniors following the art track are charged an annual \$200 studio fee and will have access to shared studio and facilities in the School of Art.

The History of Art track requires the following courses in addition to the Computer Science courses listed above: (1) one introductory, 100-level, History of Art course; (2) two History of Art courses at the 200, 300, or 400 level (the courses must represent two different areas as defined in the History of Art program description); (3) one studio art course (students may need to take a prerequisite course in Art to prepare for the studio course); (4) HSAR 401; (5) one 400-level seminar in History of Art; (6) two courses selected from CPSC 437, 475, 478, or 479, one of which must be CPSC 478 or 479; (7) one additional intermediate or advanced Computer Science course (excluding CPSC 490).

The Music track requires the following courses in addition to the Computer Science courses listed above: (1) MUSI 315; (2) five term courses chosen from MUSI 231, S290, 316, 320, 321, 409, 420, 421, 481, 495; (3) CPSC 431; (4) CPSC 432; (5) one additional intermediate or advanced Computer Science course (excluding CPSC 490).

The Theater Studies track requires the following courses in addition to the Computer Science courses listed above: (1) THST 210; (2) three courses in dramatic literature or theater history; (3) two upper-level Theater Studies production seminars in design, directing, or playwriting; (4) CPSC 431 or 432; (5) CPSC 478 or 479; (6) one additional intermediate or advanced Computer Science course (excluding CPSC 490).

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the major.

SENIOR REQUIREMENT

The senior project requires two terms: one term of CPAR 491, and one term of ARCH 491, ART 496, HSAR 499, one from MUSI 496–499, or THST 471 or 491, depending on the track chosen. The project must be approved by the DUS and be acceptable to both departments. Students must submit a written report, including an electronic abstract and webpage(s).

ADVISING AND APPROVAL OF PROGRAM

The entire program of each student majoring in Computing and the Arts must be approved by the DUS.

REQUIREMENTS OF THE MAJOR

Prerequisites *All tracks*—CPSC 100 or CPSC 112; *Art track*—ART 111, 114, and sophomore review; *Theater Studies track*—THST 110, 111

Number of courses 12 term courses beyond prereqs (not incl senior project)

Specific courses required *All tracks*—CPSC 201, 202, 223; *Architecture track*—ARCH 150, ARCH 200, 260, 262; 2 courses from CPSC 475, 478, or 479; *Art track*—ART 395 or 301; 2 from CPSC 475, 478, 479; *History of Art track*—2 from

CPSC 437, 475, 478, 479, including 1 of CPSC 478, 479; 1 intro, 100-level course; HSAR 401; *Music track*—CPSC 431, 432; MUSI 315; *Theater Studies track*—CPSC 431 or 432; CPSC 478 or 479; THST 210

Distribution of courses *All tracks*—3 addtl courses in Comp Sci, incl 1 intermediate or advanced course beyond specific reqs (excluding CPSC 490); *Architecture track*—2 courses from the concentrations: Design; History, Theory, and Criticism; and Urban Studies; *Art track*—2 courses in Art at 100 level (excluding prereqs), 2 at 200 or 300 level, and 1 at 400 level as specified; *History of Art track*—2 courses in different areas of History of Art at 200, 300, or 400 level; 1 sem at 400-level in History of Art; 1 studio art course; *Music track*—5 courses from MUSI 231, S290, 125, 316, 320, 321, 409, 420, 421, 495; *Theater Studies track*—3 courses in dramatic lit or theater history; 2 production sems, as specified

Substitution permitted MATH 244 for CPSC 202

Senior requirement *All tracks*—Two-term senior project including CPAR 491, approved by DUS; *Architecture track*—ARCH 491; *Art track*—ART 496; *History of Art track*—HSAR 499; *Music track*—one from MUSI 496–499; *Theater Studies track*—THST 471 or 491

Courses

* CPAR 291a or b, Special Projects Staff

Individual research project in computing and the arts. Requires a faculty supervisor and permission of the director of undergraduate studies. May be taken more than once for credit.

* CPAR 491a or b, Senior Project in Computing and the Arts Staff

Individual research project for majors in Computing and the Arts. Requires two faculty supervisors, one from Computer Science and one from the department in the chosen track. Requires permission of the director of undergraduate studies. The student must present both a verbal and a written report describing the results of the project. May be taken more than once for credit.

DeVane Lecture Course

DEVN 198a / EP&E 329a / GBL 444a / HIST 122a / PLSC 405a, Power and Politics in Today's World Ian Shapiro

A comparative study of power and politics since the Cold War. Topics include the decline of trade unions and increased influence of business; growing inequality and insecurity; changing attitudes towards democracy and authoritarianism; and the character and durability of the new international order. We start with the impact of the USSR's collapse, both in former communist countries and the West, focusing on reordered relations among business, labor, and governments. Next we take up the Washington Consensus on free trade, privatization, and deregulation, and agendas to fight terrorism, prevent human rights abuses, and spread democracy. Then we turn to the backlash that followed the financial crisis, as technocratic elites lost legitimacy, the global war on terror became mired in quagmires, and humanitarian intervention and democracy-spreading agendas floundered. The new politics of insecurity is our next focus. We examine the populist explosions of 2016 and the politics to which they have given rise. This leads to a consideration of responses, where we discuss the policies most needed when congenital employment insecurity is going to be the norm, and the political reforms that would increase the chances of those policies being adopted. Introductory courses in twentieth-century European, American or global history, comparative politics, or political economy are helpful but are not required. HU, SO

Directed Studies

Director of undergraduate studies: Kathryn Slanski (kathryn.slanski@yale.edu), Whitney Humanities Center 321 (53 Wall St.), 432-6630; Chair of Humanities: Bryan Garsten (bryan.garsten@yale.edu), Whitney Humanities Center 212, 432-1313; directedstudies.yale.edu

Directed Studies (DS), a selective program for first-year students, is a seminar-based interdisciplinary introduction to influential texts that have shaped Western civilization. Spanning works from ancient Greece to the twentieth century, Directed Studies is a coherent program of study that encourages students to put rich and complex texts into conversation with one another across time and across disciplinary boundaries. Students in Directed Studies learn to analyze challenging and urgent texts, participate meaningfully in seminar discussions, and write clear and persuasive analytic essays.

PREREQUISITES

Directed Studies has no prerequisites and is designed for students with or without any background in humanities or Western civilization, ancient or modern. (In order to enroll for the second term, students must have completed the first term's courses.)

UNIQUE TO THE PROGRAM

The Directed Studies program consists of three integrated full-year courses in Literature, Philosophy, and Historical and Political Thought. Approximately ten percent of the first-year class are accepted each year. Students entering the program must enroll in all three courses and are expected to enroll for both semesters. Students participating in DS become members of a close-knit and supportive intellectual cohort that endures well beyond the end of the first year.

Each of the three Directed Studies courses meets weekly for two seminars and one lecture. Seminars have a maximum of eighteen students and provide an opportunity to work closely with Yale faculty. The regular lectures and seminars are complemented by colloquia that feature distinguished speakers from Yale and beyond. Our study of written texts is enhanced by special sessions at the Yale Art Gallery, the Yale Center for British Art, and the Beinecke Rare Book and Manuscript Library.

Directed Studies fulfills a number of Yale College distributional requirements, including the two required course credits in the humanities and arts (HU), the two required course credits in the social sciences (SO), and the two required course credits in writing (WR). Moreover, courses taken in Directed Studies can be counted toward satisfying requirements in a variety of majors. For example, both terms of DS Historical and Political Thought may be counted toward the History major, and one term may be counted toward the major in Political Science; both terms of DS Literature may be counted toward the Literature major. The program serves as a strong foundation for all majors in Yale College, including many of the STEM fields, and is an outstanding basis for careers in law, public policy, business, education, the arts, journalism, consulting, engineering, and medicine.

Courses

*** DRST 001a and DRST 002b, Directed Studies: Literature** Staff

An examination of major literary works with an aim of understanding how a tradition develops. In the fall term, works and authors include Homer, Aeschylus, Sophocles, Virgil, the Bible, and Dante. In the spring term, authors vary somewhat from year to year and include Petrarch, Cervantes, Shakespeare, Milton, Wordsworth, Goethe, Tolstoy, Proust, and Eliot. WR, HU

*** DRST 003a and DRST 004b, Directed Studies: Philosophy** Staff

An examination of major figures in the history of Western philosophy with an aim of discerning characteristic philosophical problems and their interconnections. Emphasis on Plato and Aristotle in the fall term. In the spring term, modern philosophers include Descartes, Berkeley, Hume, Kant, and Nietzsche. WR, HU

*** DRST 005a and DRST 006b, Directed Studies: Historical and Political Thought**
Staff

A study of works of primary importance to political thought and intellectual history. Focus on the role of ideas in shaping events, institutions, and the fate of the individual. In the fall term, Herodotus, Thucydides, Plato, Aristotle, Augustine, and Aquinas. In the spring term, Machiavelli, Hobbes, Locke, Rousseau, Burke, Tocqueville, Emerson, Marx, Nietzsche, and Arendt. SO

East Asian Languages and Literatures

Director of undergraduate studies: Mick Hunter (mick.hunter@yale.edu), 143 Elm Street, Rm. 202, 432-7529

The major in East Asian Languages and Literatures provides rigorous training in the study of East Asian languages, literatures, cultures, and thought from ancient times through the present, with a strong focus on the reading and analysis of texts, theater, film, and other forms of media. Students select either the Chinese or the Japanese track but are encouraged to take courses in both tracks to become familiar with East Asian literary culture more broadly. The major is excellent preparation for careers in business, law, academia, foreign service, translation, journalism, etc., that demand advanced linguistic proficiency and analytical sophistication. East Asian Languages and Literatures graduates have gone on to careers in law, business, medicine, academia, film, translation, teaching, and diplomacy.

COURSES FOR NONMAJORS

All courses offered by the Department of East Asian Languages and Literatures are open to nonmajors.

COURSE NUMBERING

Language courses use the subject codes CHNS, JAPN, or KREN. Multiple titled courses that include CHNS and JAPN subject codes and are numbered 200–299 are taught in English with some sections taught in Chinese or Japanese. Courses with the subject code EALL are content courses whose focus is critical and humanistic; those numbered 200–299 are introductory, and those numbered 300–399 are advanced. Courses numbered EALL 001–099 are first-year seminars on East Asian literature, film, and humanities.

PREREQUISITE

Candidates for the major must complete CHNS 140 or JAPN 140 or the equivalent.

PLACEMENT PROCEDURES

Students who enroll in the department's language courses for the first time but who have studied Chinese, Japanese, or Korean elsewhere, and students who have skills in one of these languages because of family background, must take a placement examination at the beginning of the academic year. The times and places of the examinations are listed on the department website in August. The Chinese and Japanese examinations have online components accessed through the same site. Students of Japanese, Chinese, and Korean who are returning from programs abroad must take a placement examination, unless the course work was completed at an institution pre-approved by the Richard U. Light Fellowship program. For questions, consult with the director of undergraduate studies (DUS).

REQUIREMENTS OF THE MAJOR

The major consists of at least eleven term courses beyond the prerequisite. Students must take two terms of advanced modern Chinese (CHNS 150 and 151 or equivalents) or advanced Japanese (JAPN 150 and 151 or equivalents), as well as two terms of literary Chinese or Japanese (CHNS 170 and 171, or JAPN 170 and 171). Students also take a survey course in Chinese, Japanese, or East Asian history and culture,

preferably early in their studies. Three courses are required in literature in translation, taught in English, selected from EALL 200–399; one must be focused primarily on premodern content. These three may include courses on theater and film. In addition, two advanced courses with readings in literary or modern Chinese and/or Japanese are required.

Credit/D/Fail A maximum of one course taken Credit/D/Fail may be counted toward the requirements of the major, with permission of the director of undergraduate studies.

SENIOR REQUIREMENT

Students prepare a one-term senior essay in EALL 491 or a yearlong senior essay in EALL 492 and 493. Those who elect a yearlong essay effectively commit to taking twelve term courses in the major, because the second term of the essay may not be substituted for any of the eleven required courses.

STUDY ABROAD

Students are encouraged to study abroad. Interested students should consult with the DUS and with the office of the Richard U. Light Fellowship to apply for support for programs in China, Japan, and Korea.

REQUIREMENTS OF THE MAJOR

Prerequisite CHNS 140 or JAPN 140 or equivalent

Number of courses 11 courses (incl one-term senior essay) or 12 courses (incl yearlong senior essay) beyond prerequisite

Specific courses required *Chinese track* – CHNS 150, 151, 170, 171, or equivalents;
Japanese track – JAPN 150, 151, 170, 171, or equivalents

Distribution of courses 1 course in Chinese, Japanese, or East Asian hist and culture;
3 courses in lit in translation numbered EALL 200–399, one of them premodern; 2 adv courses with readings in Chinese and/or Japanese

Senior requirement One-term senior essay (EALL 491) or yearlong senior essay (EALL 492, 493)

CERTIFICATE OF ADVANCED LANGUAGE STUDY

The Department of East Asian Languages and Literatures offers a Certificate of Advanced Language Study in Chinese, Korean, and Japanese. A certificate adviser, typically the director of undergraduate studies (DUS), advises students on the certification process and certifies to the University Registrar's Office that students have completed the stated requirements before the end of eight terms of study. The Certificate of Advanced Language Study, once certified, is listed on student transcripts.

REQUIREMENTS

Students seeking to earn the certificate are required to take four courses beyond the L4 level in their chosen language, at least two of which must be Yale courses designated as L5. All courses must be taken for a letter grade, and students must achieve a grade of B or above. With the approval of the adviser, one advanced non-L5 course, conducted in the target language, such as an independent study course, a graduate seminar, or an advanced seminar may count toward certification requirements.

The certificate adviser may allow one “language across the curriculum” (LxC) course, which ordinarily is an advanced seminar with an additional weekly discussion section in the target language, to count toward the certification requirements. The certificate adviser may also approve the substitution of up to two credits earned during study abroad taught in the target language to count toward the certificate requirements. If the adviser approves courses taken outside of Yale for inclusion in the certificate requirements, students must take the necessary steps to ensure those courses appear on their transcript.

Credit/D/Fail No courses taken Credit/D/Fail may be counted toward the requirements of the certificate.

FACULTY OF THE DEPARTMENT OF EAST ASIAN LANGUAGES AND LITERATURES

Professors Kang-i Sun Chang, Aaron Gerow (*Chair*), Edward Kamens, Tina Lu, Jing Tsu

Assistant Professors Lucas Bender, Michael Hunter, Seth Jacobowitz

Senior Lecturer Pauline Lin

Lecturer Stephen Poland

Senior Lectors II Seungja Choi, Angela Lee-Smith

Senior Lectors Hsiu-hsien Chan, Min Chen, Koichi Hiroe, Rongzhen Li, Ninghui Liang, Fan Liu, Yoshiko Maruyama, Michiaki Murata, Hiroyo Nishimura, Masahiko Seto, Jianhua Shen, Mari Stever, Wei Su, Chuanmei Sun, Haiwen Wang, Yu-lin Wang Saussy, Peisong Xu, Yongtao Zhang, William Zhou

Lector Aoi Saito

Affiliated Faculty Chloe Starr (*Divinity School*)

East Asian Humanities

EALL 200a / CHNS 200a / EAST 240a / HUMS 270a, The Chinese Tradition Lucas Bender

An introduction to the literature, culture, and thought of premodern China, from the beginnings of the written record to the turn of the twentieth century. Close study of textual and visual primary sources, with attention to their historical and cultural backdrops. Students enrolled in CHNS 200 join a weekly Mandarin-language discussion section. No knowledge of Chinese required for students enrolled in EALL 200. Students enrolled in CHNS 200 must have L5 proficiency in Mandarin or permission of the course instructor. HU TR

EALL 211a / EAST 241a / LITR 174a / WGSS 405a, Women and Literature in Traditional China Kang-i Sun Chang

A study of major women writers in traditional China, as well as representations of women by male authors. The power of women's writing; women and material culture; women in exile; courtesans; Taoist and Buddhist nuns; widow poets; cross-dressing women; the female body and its metaphors; footbinding; notions of love and death; the aesthetics of illness; women and revolution; poetry clubs; the function of memory in women's literature; problems of gender and genre. All readings in translation; no

knowledge of Chinese required. Some Chinese texts provided for students who read Chinese. Formerly CHNS 201. HU TR

EALL 212a / PHIL 203a, Ancient Chinese Thought Michael Hunter

An introduction to the foundational works of ancient Chinese thought from the ruling ideologies of the earliest historical dynasties, through the Warring States masters, to the Qin and Han empires. Topics include Confucianism and Daoism, the role of the intellectual in ancient Chinese society, and the nature and performance of wisdom. HU

*** EALL 230b / EAST 242b / HUMS 269b, Poetry and Ethics Amidst Imperial Collapse**

Lucas Bender

Du Fu has for the last millennium been considered China's greatest poet. Close study of nearly one-sixth of his complete works, contextualized by selections from the tradition that defined the art in his age. Exploration of the roles literature plays in interpreting human lives and the ways different traditional forms shape different ethical orientation. Poetry as a vehicle for moral reflection. All readings are in English. WR, HU

EALL 255b / EAST 252b, Japanese Modernism Seth Jacobowitz

Japanese literature and art from the 1920s through the 1940s. The avant-garde and mass culture; popular genre fiction; the advent of new media technologies and techniques; effects of Japanese imperialism, militarism, and fascism on cultural production; experimental writers and artists and their resistance to, or complicity with, the state. HU

EALL 270b / FILM 306b, Anime and the Posthuman Seth Jacobowitz

Japanese anime and its conceptions of the posthuman condition made possible by advances in science and technology. The persistence of myth, archetype, and humanist philosophy. HU

*** EALL 281a / FILM 304a, Japanese Cinema and Its Others** Aaron Gerow

Critical inquiry into the myth of a homogeneous Japan through analysis of how Japanese film and media historically represents “others” of different races, ethnicities, nationalities, genders, and sexualities, including blacks, ethnic Koreans, Okinawans, Ainu, undocumented immigrants, LGBT minorities, the disabled, youth, and monstrous others like ghosts. HU

*** EALL 286a / EAST 261a / HUMS 290a / LITR 285a / PORT 360a, The Modern Novel in Brazil and Japan** Seth Jacobowitz

Brazilian and Japanese novels from the late nineteenth century to the present. Representative texts from major authors are read in pairs to explore their commonalities and divergences. Topics include nineteenth-century realism and naturalism, the rise of mass culture and the avant-garde, and existentialism and postmodernism. No knowledge of Portuguese or Japanese required. HU TR

*** EALL 296b / EAST 391b / RLST 121b, Religion and Culture in Korea** Hwansoo Kim

Introduction to Shamanism, Buddhism, Confucianism, Daoism, Christianity, and new religions in Korea from ancient times to the present. Examination of religious traditions in close relationships with social, economic, political, and cultural environments in Korean society. Examination of religious tensions, philosophical arguments, and ethical issues that indigenous and foreign religions in Korea have engaged throughout history to maximize their influence in Korean society. HU

* **EALL 300a / EAST 340a, Sinological Methods** Pauline Lin

A research course in Chinese studies, designed for students with background in modern and literary Chinese. Exploration and evaluation of the wealth of primary sources and research tools available in Chinese. For native speakers of Chinese, introduction to the secondary literature in English and instruction in writing professionally in English on topics about China. Topics include the compilation and development of Chinese bibliographies; bibliophiles' notes; editions, censorship, and textual variation and reliability; specialized dictionaries; maps and geographical gazetteers; genealogies and biographical sources; archaeological and visual materials; and major Chinese encyclopedias and compendia. Prerequisite: CHNS 171 or equivalent. Formerly CHNS 202. HU

* **EALL 301a, Ancient and Medieval Chinese Poetry** Lucas Bender

Readings in ancient and middle-period Chinese poetry, from the beginnings of the tradition through the Song dynasty. Prerequisite: one year of classical/literary Chinese or equivalent, or permission of the instructor. HU

* **EALL 303b, Readings in Classical Chinese Poetry** Kang-i Sun Chang

Study of successive appropriations and reorientation of Chinese poetic forms in the major genres, such as song lyric (ci) and vernacular lyric (qu) traditions, traced from early foundations to those written in later times. Topics include the creation of cultural values and identities, problems of authorship and authority, exile and poetic writing, reception, and material culture. Readings in Chinese; discussion in English. Prerequisite: CHNS 171 or equivalent, or permission of instructor. Formerly CHNS 303. HU

EALL 308b / HUMS 305b / PHIL 410b, Sages of the Ancient World Michael Hunter
Comparative survey of ancient discourses about wisdom from China, India, the Near East, Egypt, Greece, and Rome. Topics include teaching, scheming, and dying. HU

* **EALL 325a, Chinese Poetic Form, 1490–1990** Kang-i Sun Chang

Development of the classical Chinese poetic form by modern Chinese poets. The appeal and aesthetic concept of the classical form since the revivalist movement of the late fifteenth century. Emphasis on close critical reading, with attention to cultural and political contexts. Readings in Chinese; discussion in English. Prerequisite: a literary Chinese course or permission of instructor. HU

* **EALL 470a or b and EALL 471a or b, Independent Tutorial** Michael Hunter

For students with advanced Chinese, Japanese, or Korean language skills who wish to engage in concentrated reading and research on literary works in a manner not otherwise offered in courses. The work must be supervised by a specialist and must terminate in a term paper or its equivalent. Ordinarily only one term may be offered toward the major or for credit toward the degree. Permission to enroll requires submission of a detailed project proposal by the end of the first week of classes and its approval by the director of undergraduate studies.

* **EALL 491a or b, Senior Essay** Michael Hunter

Preparation of a one-term senior essay under faculty supervision.

* **EALL 492a or b and EALL 493a or b, Yearlong Senior Essay** Michael Hunter

Preparation of a two-term senior essay under faculty supervision. Credit for EALL 492 only on completion of EALL 493.

Chinese

*** CHNS 110a, Elementary Modern Chinese I** Staff

Intended for students with no background in Chinese. An intensive course with emphasis on spoken language and drills. Pronunciation, grammatical analysis, conversation practice, and introduction to reading and writing Chinese characters. L1 RP 1½ Course cr

CHNS 112a, Elementary Modern Chinese for Advanced Learners I Hsiu-hsien Chan

First level of the advanced learner sequence. Intended for students with some aural proficiency but very limited ability in reading and writing Chinese. Training in listening and speaking, with emphasis on reading and writing. Placement confirmed by placement test and by instructor. L1 RP 1½ Course cr

*** CHNS 120b, Elementary Modern Chinese II** Staff

Continuation of CHNS 110. After CHNS 110 or equivalent. L2 RP 1½ Course cr

CHNS 122b, Elementary Modern Chinese for Advanced Learners II Hsiu-hsien Chan

Continuation of CHNS 112. L2 1½ Course cr

*** CHNS 130a, Intermediate Modern Chinese I** Staff

An intermediate course that continues intensive training in listening, speaking, reading, and writing and consolidates achievements from the first year of study. Students improve oral fluency, study more complex grammatical structures, and enlarge both reading and writing vocabulary. After CHNS 120 or equivalent. L3 RP 1½ Course cr

*** CHNS 132a, Intermediate Modern Chinese for Advanced Learners I** Staff

The second level of the advanced learner sequence. Intended for students with intermediate oral proficiency and elementary reading and writing proficiency. Students receive intensive training in listening, speaking, reading, and writing, supplemented by audio and video materials. The objective of the course is to balance these four skills and work toward attaining an advanced level in all of them. Prerequisite: CHNS 122b or equivalent. L3 RP 1½ Course cr

*** CHNS 140b, Intermediate Modern Chinese II** Staff

Continuation of CHNS 130. To be followed by CHNS 150. After CHNS 130 or equivalent. L4 RP 1½ Course cr

*** CHNS 142b, Intermediate Modern Chinese for Advanced Learners II** Staff

Continuation of CHNS 132. After CHNS 132 or equivalent. L4 1½ Course cr

*** CHNS 150a, Advanced Modern Chinese I** Staff

Third level of the standard foundational sequence of modern Chinese, with study in speaking, listening, reading, and writing. Use of audiovisual materials, oral presentations, skits, and longer and more frequent writing assignments to assimilate more sophisticated grammatical structures. Further introduction to a wide variety of written forms and styles. Use of both traditional and simplified forms of Chinese characters. After CHNS 140 or equivalent. L5

*** CHNS 151b, Advanced Modern Chinese II** Staff

Continuation of CHNS 150. After CHNS 150 or equivalent. L5

*** CHNS 152a, Advanced Modern Chinese for Advanced Learners I** Staff

The third level of the advanced learner sequence. Intended for students with intermediate high to advanced low speaking and listening skills and with intermediate

reading and writing skills. The goal of the course is to help students effectively expand their skills in reading and writing while concurrently addressing the need to improve their listening and oral skills in formal environments. The materials cover a variety of topics relating to Chinese culture, society and cultural differences, supplemented with authentic video materials. Prerequisite: CHNS 142 or equivalent. L5

*** CHNS 153b, Advanced Modern Chinese for Advanced Learners II** Staff

The second level of the advanced learner sequence. Intended for students with intermediate to advanced oral proficiency and high elementary reading and writing proficiency. Students receive intensive training in listening, speaking, reading, and writing, supplemented by audio and video materials. The objective of the course is to balance these four skills and work toward attaining an advanced level in all of them. After CHNS 152 or equivalent. L5

*** CHNS 154a, Upper Advanced Modern Chinese III** Staff

Fourth level of the standard foundational sequence of modern Chinese, with study in speaking, listening, reading, and writing. Readings in a wide range of subjects form the basis of discussion and other activities. Students consolidate their skills, especially speaking proficiency, at an advanced level. Materials use both simplified and traditional characters. After CHNS 151 or equivalent. L5

*** CHNS 155b, Upper Advanced Modern Chinese IV** Staff

Continuation of CHNS 154. After CHNS 154 or equivalent. L5

*** CHNS 162a, Upper Advanced Modern Chinese for Advanced Learners III** Wei Su

Intended for students with advanced speaking and listening skills and with advanced low reading and writing skills (able to write 1,000–1,200 characters). Further readings on contemporary life in China and Taiwan, supplemented with authentic video materials. Class discussion, presentations, and regular written assignments. Texts in simplified characters with vocabulary in both simplified and traditional characters. After CHNS 153 or equivalent. L5

*** CHNS 163b, Upper Advanced Modern Chinese for Advanced Learners IV** Wei Su

Third level of the advanced learner sequence in Chinese. Intended for students with advanced speaking and listening skills (able to conduct conversations fluently) and with high intermediate reading and writing skills (able to write 1,000–1,200 characters). Further readings on contemporary life in China and Taiwan, supplemented with authentic video materials. Class discussion, presentations, and regular written assignments. Texts in simplified characters with vocabulary in both simplified and traditional characters. After CHNS 162 or equivalent. L5

*** CHNS 164a, Readings in Contemporary Chinese Fiction** Wei Su

Selected readings in Chinese fiction of the 1980s and 1990s. Development of advanced language skills in reading, speaking, and writing for students with an interest in literature and literary criticism. After CHNS 155, 162, or equivalent. L5

*** CHNS 165b, Readings in Modern Chinese Fiction** Wei Su

Reading and discussion of modern short stories, most written prior to 1949. Development of advanced language skills in reading, speaking, and writing for students with an interest in literature and literary criticism. After CHNS 155, 162, or equivalent. L5

*** CHNS 166a and CHNS 167b, Chinese Media and Society** William Zhou

Advanced language course with a strong focus on speaking and writing skills in formal style. Current affairs and issues in contemporary Chinese society explored through media forms such as news and blogs on the Internet, television, film, fine arts and so on. L5

*** CHNS 168a and CHNS 169b, Chinese for Global Enterprises** Min Chen

Advanced language course with a focus on Chinese business terminology and discourse. Discussion of China's economic and management reforms, marketing, economic laws, business culture and customs, and economic relations with other countries. Case studies from international enterprises that have successfully entered the Chinese market. After CHNS 155, 162, or equivalent. L5

CHNS 170a, Introduction to Literary Chinese I Michael Hunter

Reading and interpretation of texts in various styles of literary Chinese (*wenyan*), with attention to basic problems of syntax and literary style. After CHNS 151, 153, or equivalent. L5

CHNS 171b, Introduction to Literary Chinese II Pauline Lin

Continuation of CHNS 170. After CHNS 170. L5

*** CHNS 172a, Chinese for Scholarly Conversation** Yongtao Zhang

This course aims to bring students to advanced competence in all aspects of modern Chinese, and prepare students for advanced research or employment in a variety of China-related fields. Materials include readings on contemporary social, cultural, and political issues, which are written by prominent scholar writers in related fields. This level is suitable for students who have had four years of college Chinese prior to attending, or who have taken three years of an accelerated program meant for heritage speakers. Prerequisite: CHNS 155, CHNS 162, placement results equivalent to L5, or permission of instructor. L5

Japanese

*** JAPN 110a, Elementary Japanese I** Staff

Introductory language course for students with no previous background in Japanese. Development of proficiency in listening, speaking, reading, and writing, including 50 hiragana, 50 katakana, and 75 kanji characters. Introduction to cultural aspects such as levels of politeness and group concepts. In-class drills in pronunciation and conversation. Individual tutorial sessions improve conversational skills. L1 RP
1½ Course cr

*** JAPN 120b, Elementary Japanese II** Staff

Continuation of JAPN 110, with additional materials such as excerpts from television shows, anime, and songs. Introduction of 150 additional kanji. After JAPN 110 or equivalent. L2 RP 1½ Course cr

*** JAPN 130a, Intermediate Japanese I** Staff

Continued development in both written and spoken Japanese. Aspects of Japanese culture, such as history, art, religion, and cuisine, explored through text, film, and animation. Online audio and visual aids facilitate listening, as well as the learning of grammar and kanji. Individual tutorial sessions improve conversational skills. After JAPN 120 or equivalent. L3 RP 1½ Course cr

* **JAPN 140b, Intermediate Japanese II** Staff

Continuation of JAPN 130. After JAPN 130 or equivalent. L4 RP 1½ Course cr

* **JAPN 150a, Advanced Japanese I** Staff

Advanced language course that further develops proficiency in reading, writing, speaking, and listening. Reading and discussion materials include works by Nobel Prize winners. Japanese anime and television dramas are used to enhance listening and to develop skills in culturally appropriate speech. Writing of essays, letters, and criticism solidifies grammar and style. Individual tutorial sessions improve conversational skills. After JAPN 140 or equivalent. L5 RP

* **JAPN 151b, Advanced Japanese II** Staff

Continuation of JAPN 150. After JAPN 150 or equivalent. L5 RP

* **JAPN 156a, Advanced Japanese III** Mari Stever

Close reading of modern Japanese writing on current affairs, social science, history, and literature. Development of speaking and writing skills in academic settings, including formal speeches, interviews, discussions, letters, e-mail, and expository writing. Interviews of and discussions with native speakers on current issues. Individual tutorial sessions provide speaking practice. After JAPN 151 or equivalent. L5 RP

* **JAPN 157b, Advanced Japanese IV** Mari Stever

Continuation of JAPN 156. After JAPN 156 or equivalent. L5

Korean

* **KREN 110a / KREN S110, Elementary Korean I** Staff

A beginning course in modern Korean. Pronunciation, lectures on grammar, conversation practice, and introduction to the writing system (*Hankul*). L1
1½ Course cr

* **KREN 120b, Elementary Korean II** Staff

Continuation of KREN 110. After KREN 110 or equivalent. L2 RP 1½ Course cr

* **KREN 130a, Intermediate Korean I** Seungja Choi

Continued development of skills in modern Korean, spoken and written, leading to intermediate-level proficiency. After KREN 120 or equivalent. L3 RP 1½ Course cr

* **KREN 132a, Intermediate Korean for Advanced Learners I** Seungja Choi

Intended for students with some oral proficiency but little or no training in *Hankul*. Focus on grammatical analysis, the standard spoken language, and intensive training in reading and writing. L3 RP 1½ Course cr

* **KREN 140b, Intermediate Korean II** Staff

Continuation of KREN 130. After KREN 130 or equivalent. L4 RP 1½ Course cr

* **KREN 142b, Intermediate Korean for Advanced Learners II** Angela Lee-Smith

Continuation of KREN 132. After KREN 132 or equivalent. L4 RP 1½ Course cr

KREN 150a, Advanced Korean I: Korean Language and Culture through K-Pop Music

Angela Lee-Smith

An advanced language course with emphasis on developing vocabulary and grammar, practice reading comprehension, speaking on a variety of topics, and writing in both formal and informal styles. Use storytelling, discussion, peer group activities, audio and

written journals, oral presentations, and supplemental audiovisual materials and texts in class. Intended for nonheritage speakers. After KREN 140 or equivalent. L5

KREN 151b, Advanced Korean II Angela Lee-Smith

Continuation of KREN 150. After KREN 150 or equivalent. L5

* **KREN 152a, Advanced Korean for Advanced Learners** Angela Lee-Smith

An advanced course in modern Korean. Reading of short stories, essays, and journal articles, and introduction of 200 Chinese characters. Students develop their speaking and writing skills through discussions and written exercises. After KREN 142 or 151, or with permission of instructor. L5 1½ Course cr

* **KREN 154b, Advanced Korean III** Seungja Choi

An advanced language course designed to develop reading and writing skills using Web-based texts in a variety of genres. Students read texts independently and complete comprehension and vocabulary exercises through the Web. Discussions, tests, and intensive writing training in class. After KREN 151 or equivalent. L5

East Asian Studies

Director of undergraduate studies: Mimi Yiengpruksawan
(mimi.yiengpruksawan@yale.edu), 653 LORIA, 432-2682, ceas.yale.edu

In the East Asian Studies major, students focus on a country or an area within East Asia and concentrate their work in the humanities or the social sciences. The major offers a liberal education that serves as excellent preparation for graduate study or for business and professional careers in which an understanding of East Asia is essential.

The major in East Asian Studies is interdisciplinary, and students typically select classes from a wide variety of disciplines. The proposed course of study must be approved by the director of undergraduate studies (DUS).

PREREQUISITE

The prerequisite to the major is completion of study at the L2 level of an East Asian language taught at Yale or the equivalent.

REQUIREMENTS OF THE MAJOR

Beyond the prerequisite, the major consists of thirteen course credits, which may include up to six taken in a preapproved program of study abroad. Six course credits must be taken in East Asian language courses, including a course at the L4 level and one year of advanced study (L5) with readings in the East Asian language.

Beyond the language requirement, the major includes seven course credits, six in the country or area of concentration and one outside it. Of the course credits in the area of concentration, one must be in the premodern period, at least two must be seminars, and one is the senior requirement. These courses are normally taken at Yale during the academic year, but with prior approval of the DUS the requirement may be fulfilled through successful course work undertaken elsewhere.

Credit/D/Fail A maximum of one course taken Credit/D/Fail may be counted toward the requirements of the major, with permission of the DUS.

SENIOR REQUIREMENT

During the senior year, all students must satisfy a senior requirement consisting of a major research project that uses Chinese-, Japanese-, or Korean-language materials, reflects an up-to-date understanding of the region, and demonstrates a strong command of written English. This requirement can be met in one of three ways. Students may take a seminar that relates to the country or area of concentration, culminating in a senior thesis. Alternatively, students who are unable to write a senior essay in a seminar may complete a one-term senior essay in EAST 480 or a one-credit, two-term senior research project in EAST 491, 492 culminating in an essay. The adviser for the senior project should be a faculty member associated with the Council on East Asian Studies with a reading knowledge of the target language materials consulted for the essay.

ADVISING

Selection of courses Upon entering the major, students are expected to draw up an intellectually coherent sequence of courses in consultation with the DUS. They must consult with the DUS each term concerning their course schedules. They

should identify as soon as possible a faculty adviser in their area of specialization. As a multidisciplinary program, East Asian Studies draws on the resources of other departments and programs in the University. Students are encouraged to examine the offerings of other departments in both the humanities and the social sciences, as well as residential college seminars, for additional relevant courses. The stated area of concentration of each student determines the relevance and acceptability of other courses. For a complete listing of courses approved for the major, see the Council on East Asian Studies website.

Courses in the graduate and professional schools Qualified students may elect pertinent courses in the Graduate School and in some of the professional schools with permission of the instructor, the EAST DUS, and the director of graduate studies of the relevant department or the dean or registrar of the professional school.

Combined B.A./M.A. degree program Exceptionally able and well-prepared students may complete a course of study leading to the simultaneous award of the B.A. and M.A. degrees after eight terms of enrollment. See Academic Regulations, section K, Special Arrangements, "Simultaneous Award of the Bachelor's and Master's Degrees." Interested students should consult the DUS prior to the fifth term of enrollment for specific requirements in East Asian Studies.

REQUIREMENTS OF THE MAJOR

Prerequisite L2 level of an East Asian lang taught at Yale or the equivalent

Number of courses 13 course credits beyond prereq (incl senior req); up to 6 may be in preapproved study abroad

Distribution of courses 6 course credits in East Asian lang courses, incl 1 L4 course and 1 year at L5 level with readings in the lang; 6 addtl course credits in country or area of concentration, incl 1 in premodern era and 2 sems; 1 course credit on East Asia outside country or area of concentration

Senior requirement Senior sem culminating in senior thesis, or one-term senior essay in EAST 480, or one-credit, two-term senior research proj in EAST 491, 492 culminating in an essay

FACULTY ASSOCIATED WITH THE PROGRAM OF EAST ASIAN STUDIES

Professors Daniel Botsman (*History*), Kang-i Sun Chang (*East Asian Languages & Literatures*), Fabian Drixler (*History*), Aaron Gerow (*East Asian Languages & Literatures; Film & Media Studies*), Valerie Hansen (*History*), Edward Kamens (*East Asian Languages & Literatures*), Tina Lu (*East Asian Languages & Literatures*), Peter Perdue (*History*), Frances Rosenbluth (*Political Science*), Helen Siu (*Anthropology*), Jing Tsu (*East Asian Languages & Literatures; Comparative Literature*), Anne Underhill (*Anthropology*), Mimi Yiengpruksawan (*History of Art*)

Associate Professors William Honeychurch (*Anthropology*), Michael Hunter (*East Asian Languages & Literatures*), Hwansoo Kim (*Religious Studies*), Chloe Starr (*Divinity School*)

Assistant Professors Lucas Bender (*East Asian Languages & Literatures*), Eric Greene (*Religious Studies*), Denise Ho (*History*), Seth Jacobowitz (*East Asian Languages & Literatures*), Daniel Mattingly (*Political Science*)

Senior Lecturer Pauline Lin (*East Asian Languages & Literatures*)

Lecturers Garrett Bredell, Russell Burge, Charles Chang, Paula Curtis, Jooyeon Hahm, Gabrielle Niu, David Porter, Tomonori Sugimoto, Michael Thornton

Senior Lectors II Seungja Choi, Angela Lee-Smith

Senior Lectors Hsiu-hsien Chan, Min Chen, Koichi Hiroe, Rongzhen Li, Ninghui Liang, Fan Liu, Yoshiko Maruyama, Michiaki Murata, Hiroyo Nishimura, Aoi Saito, Yu-lin Wang Saussy, Masahiko Seto, Jianhua Shen, Mari Stever, Wei Su, Chuanmei Sun, Haiwen Wang, Peisong Xu, Yongtao Zhang, William Zhou

Lector Ho Eun Park

Courses

* **EAST 016a / HSAR 016a, Chinese Painting and Culture** Quincy Ngan

This course focuses on important works of Chinese painting and major painters from the fourth century CE to the twentieth century. Through close readings of the pictorial contents and production contexts of such works of art, this course investigates the works' formats, meanings, and innovations from social, historical, and art-historical perspectives. In this course, students become familiar with the traditional Chinese world and acquire the knowledge necessary to be an informed viewer of Chinese painting. Discussions of religion, folkloric beliefs, literature, relationships between men and women, the worship of mountains, the laments of scholars, and the tastes of emperors and wealthy merchants also allow students to understand the cultural roots of contemporary China. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program.

EAST 220b / HIST 321b, China from Present to Past, 2015–600 Valerie Hansen

Underlying causes of current issues facing China traced back to their origins in the premodern period. Topics include economic development, corruption, environmental crises, gender, and Pacific island disputes. Selected primary-source readings in English, images, videos, and Web resources. *Optional additional Chinese-language and English-language sections. HU

EAST 237b / HSAR 237b, Arts of China Staff

Arts of China is a window to the nation's history, culture, society, and aesthetics. This course introduces the visual arts of China from the prehistoric period to the twentieth century. We look at the archaeological findings (including pottery, jade, and bronze vessels) as well as ancestor worship and belief in posthumous souls and immortal mountains. We look at the art and architecture inspired by Buddhism, Taoism, and Confucianism. We investigate the place of Chinese painting and calligraphy in court and elite cultures and explore how these arts intertwine with politics, printing culture, and popular culture. Lastly, we investigate the decorative arts, like ceramics, textiles, and furniture, as well as the art and architecture that reflect foreign tastes.

EAST 240a / CHNS 200a / EALL 200a / HUMS 270a, The Chinese Tradition Lucas Bender

An introduction to the literature, culture, and thought of premodern China, from the beginnings of the written record to the turn of the twentieth century. Close study of textual and visual primary sources, with attention to their historical and cultural backdrops. Students enrolled in CHNS 200 join a weekly Mandarin-language

discussion section. No knowledge of Chinese required for students enrolled in EALL 200. Students enrolled in CHNS 200 must have L5 proficiency in Mandarin or permission of the course instructor. HU

EAST 241a / EALL 211a / LITR 174a / WGSS 405a, Women and Literature in Traditional China Kang-i Sun Chang

A study of major women writers in traditional China, as well as representations of women by male authors. The power of women's writing; women and material culture; women in exile; courtesans; Taoist and Buddhist nuns; widow poets; cross-dressing women; the female body and its metaphors; footbinding; notions of love and death; the aesthetics of illness; women and revolution; poetry clubs; the function of memory in women's literature; problems of gender and genre. All readings in translation; no knowledge of Chinese required. Some Chinese texts provided for students who read Chinese. Formerly CHNS 201. HU

*** EAST 242b / EALL 230b / HUMS 269b, Poetry and Ethics Amidst Imperial Collapse** Lucas Bender

Du Fu has for the last millennium been considered China's greatest poet. Close study of nearly one-sixth of his complete works, contextualized by selections from the tradition that defined the art in his age. Exploration of the roles literature plays in interpreting human lives and the ways different traditional forms shape different ethical orientation. Poetry as a vehicle for moral reflection. All readings are in English. WR, HU

EAST 252b / EALL 255b, Japanese Modernism Seth Jacobowitz

Japanese literature and art from the 1920s through the 1940s. The avant-garde and mass culture; popular genre fiction; the advent of new media technologies and techniques; effects of Japanese imperialism, militarism, and fascism on cultural production; experimental writers and artists and their resistance to, or complicity with, the state. HU

*** EAST 261a / EALL 286a / HUMS 290a / LITR 285a / PORT 360a, The Modern Novel in Brazil and Japan** Seth Jacobowitz

Brazilian and Japanese novels from the late nineteenth century to the present. Representative texts from major authors are read in pairs to explore their commonalities and divergences. Topics include nineteenth-century realism and naturalism, the rise of mass culture and the avant-garde, and existentialism and postmodernism. No knowledge of Portuguese or Japanese required. HU

EAST 301b / HIST 307b, The Making of Japan's Great Peace, 1550–1850 Fabian Drixler

Examination of how, after centuries of war in Japan and overseas, the Tokugawa shogunate built a peace that lasted more than 200 years. Japan's urban revolution, the eradication of Christianity, the Japanese discovery of Europe, and the question of whether Tokugawa Japan is a rare example of a complex and populous society that achieved ecological sustainability. HU

*** EAST 303a / HIST 303Ja, Hong Kong and China: A Cross-Border History** Denise Ho

This departmental seminar studies the historical development of Hong Kong and China in relation to each other, from the colonial and late imperial experience to their shared histories in national and political movements, from postwar industrialization to reform-era economic growth, culminating in the 1997 handover and its attendant

political and economic integration. The readings from the first half of the semester come primarily from the literature in history, while the readings in the second half draw from anthropology, economics, political science, and sociology. Each week readings include primary sources in or translated into English. HU, SO

* **EAST 309a or b / HIST 309Ja or b, Uses of the Past in Modern China** Denise Ho
Modern China's use of the past in state-sponsored narratives of nation, in attempts to construct heritage by elites and intellectuals, and in grassroots projects of remembrance. Theories on history and memory; primary sources in English translation; case studies from twentieth-century China. Interdisciplinary readings in art history, anthropology, cultural studies, and history. WR, HU

EAST 338a / ECON 338a / GBL 318a, The Next China Stephen Roach
Economic development in China since the late 1970s. Emphasis on factors pushing China toward a transition from its modern export- and investment-led development model to a pro-consumption model. The possibility of a resulting identity crisis, underscored by China's need to embrace political reform and by the West's long-standing misperceptions of China. Prerequisite: introductory macroeconomics. SO

* **EAST 340a / EALL 300a, Sinological Methods** Pauline Lin
A research course in Chinese studies, designed for students with background in modern and literary Chinese. Exploration and evaluation of the wealth of primary sources and research tools available in Chinese. For native speakers of Chinese, introduction to the secondary literature in English and instruction in writing professionally in English on topics about China. Topics include the compilation and development of Chinese bibliographies; bibliophiles' notes; editions, censorship, and textual variation and reliability; specialized dictionaries; maps and geographical gazetteers; genealogies and biographical sources; archaeological and visual materials; and major Chinese encyclopedias and compendia. Prerequisite: CHNS 171 or equivalent. Formerly CHNS 202. HU

EAST 375a or b / HIST 375a or b, China from Mao to Now Denise Ho
The history of the People's Republic of China from Mao to now, with a focus on understanding the recent Chinese past and framing contemporary events in China in historical context. How the party-state is organized; interactions between state and society; causes and consequences of economic disparities; ways in which various groups – from intellectuals to religious believers – have shaped the meaning of contemporary Chinese society. HU

* **EAST 390b / RLST 102b, Atheism and Buddhism** Hwansoo Kim
A critical examination of atheism and religions (Buddhism), with a focus on intellectual, religious, philosophical, and scientific debates about God, the origin of the universe, morality, evolution, neuroscience, happiness, enlightenment, the afterlife, and karma. Readings selected from philosophical, scientific, and religious writings. Authors include some of the following: Charles Darwin, Bertrand Russell, Christopher Hitchens, Richard Dawkins, Deepak Chopra, Sam Harris, Owen Flanagan, Stephen Batchelor, and the Dalai Lama. HU

* **EAST 391b / EALL 296b / RLST 121b, Religion and Culture in Korea** Hwansoo Kim
Introduction to Shamanism, Buddhism, Confucianism, Daoism, Christianity, and new religions in Korea from ancient times to the present. Examination of religious traditions

in close relationships with social, economic, political, and cultural environments in Korean society. Examination of religious tensions, philosophical arguments, and ethical issues that indigenous and foreign religions in Korea have engaged throughout history to maximize their influence in Korean society. HU

*** EAST 402b / HIST 305Jb, Empire and Identity in Qing China** Staff

This seminar covers the history of the Qing empire, which governed China and large parts of Inner Asia from 1644 to 1912, with a thematic focus on a key question: how did the politics of identity manifest in a society organized under a governmental structure and set of intellectual assumptions very different from those we are familiar with today? The course examines the roles of identity categories like ethnicity, gender, sexuality, religion, and status in the Qing empire and interrogates the role of the Qing imperial system, as a particular political system, in managing different forms of identity. In addition to its core focus on the Qing, the course includes discussions of Chosŏn Korea and the Republic of China, to consider both the role of Qing empire in regional politics and the legacy of empire in China's later history. HU

*** EAST 404a / HIST 307Ja, The Written Word in Japan, Prehistory to 1600** Staff

In premodern Japan, text and writing had the power to imbue swords with ritual meaning, evoke the pathos of cherry blossoms, or reveal means of salvation. People from all walks of life produced and consumed the written word in different ways, whether they hoped to shape military regimes or simply send messages to loved ones, as we might today. In what ways did textuality (or, in some cases, its absence or conscious rejection) shape Japan's social, political, economic, and religious development? What is a "text"? How does understanding its use by diverse peoples across centuries challenge our underlying assumptions about how documents, writing, and communication function in society? Surveying these issues from prehistory to 1600, this course uses writing traditions and documentary culture as a lens through which to understand Japanese history and ways of being in Japan's premodern world. Students use primary and secondary readings to discuss core issues in writing and textual culture, such as language, orality, transmission, translation, gender, genre, communication, and visibility. A complementary emphasis on how we, as modern readers, writers, and scholars, interpret and use written materials further provides students with new strategies for thinking about how history is recorded, consumed, and evaluated. No previous knowledge of Japanese or Japanese history is required. HU

*** EAST 406b / ANTH 241b, Nature and Culture in and of East Asia** Staff

How is nature in East Asia shaped by distinct histories of modernization, colonialism, militarism, the Cold War, and developmentalism in the region? What is the impact of transnational flows of objects, people, ideas, and discourses – whether they are natural resources, waste, environmental activists, or green urbanism – on nature? How do recent anxieties about adulterated food, radiation, and pollution reveal environmental interconnections among Japan, China, Taiwan, Hong Kong, Korea, and beyond? Why are marginalized groups like Okinawans, indigenous people, and rural poor peasants disproportionately affected by environmental problems? By addressing such questions, this course aims to unpack the relationship between nature, culture, and power in East Asia. Reading interdisciplinary accounts from history, anthropology, and literary and cultural studies, we engage the growing field of environmental humanities from a uniquely East Asian perspective. Topics include the relationship between East Asian colonial experience and nature; state power and water resources; air pollution;

nuclear radiation; the emergence of environmental conservation discourse; interspecies connections; and food safety. SO

*** EAST 454b / ECON 474b / GLBL 312b, Economic and Policy Lessons from Japan**

Stephen Roach

An evaluation of modern Japan's protracted economic problems and of their potential implications for other economies, including the United States, Europe, and China. Policy blunders, structural growth impediments, bubbles, the global economic crisis of 2008, and Abenomics; risks of secular stagnation and related dangers to the global economy from subpar post-crisis recoveries. Focus on policy remedies to avert similar problems in other countries. Prerequisite: an introductory course in macroeconomics. SO

*** EAST 469a / HSAR 469a, Contemporary Art and Culture in China** Staff

This course is an introduction to the art and culture of contemporary China, covering the period from 1960s to the present day. It focuses on art objects, performances, propaganda, and exhibitions produced by the government, the business sector, curators, and avant-garde artists in Mainland China. We also look at China's Olympic stadiums, the Three Gorges Dam, and skyscrapers (including those in Hong Kong and Taiwan). Class meetings discuss the required readings and investigate artworks, films, and events that speak to China's political ideologies, society, and economy, as well as its role in globalization and international conflicts. To establish a cross-cultural interpretation, this class also explores how Euro-American artists and filmmakers used their arts to express their views on contemporary China.

*** EAST 474b / HSAR 484b, Japanese Screens** Mimi Yiengpruksawan

The screen-painting tradition in Japan, particularly as it emerged in the sixteenth and seventeenth centuries. The format, techniques, and functions of screen painting; poetic and literary connections, as well as studio practices and politics, of the principal lineages of painters; aesthetics and styles associated with varying classes of patronage, from the shoguns to Buddhist monks to the Japanese court. HU

EAST 480a or b, One-Term Senior Essay DUS: Director of Undergraduate Studies
Preparation of a one-term senior essay under the guidance of a faculty adviser. Students must receive the prior agreement of the director of undergraduate studies and of the faculty member who will serve as the senior essay adviser. Students must arrange to meet with that adviser on a regular basis throughout the term.

*** EAST 491a and EAST 492b, Senior Research Project** DUS: Director of Undergraduate Studies

Two-term directed research project under the supervision of a ladder faculty member. Students should write essays using materials in East Asian languages when possible. Essays should be based on primary material, whether in an East Asian language or English. Summary of secondary material is not acceptable. Credit for EAST 491 only on completion of EAST 492. ½ Course cr per term

Electives within the Major

PREMODERN PERIOD

CHNS 170a, Introduction to Literary Chinese I Michael Hunter

Reading and interpretation of texts in various styles of literary Chinese (*wenyan*), with attention to basic problems of syntax and literary style. After CHNS 151, 153, or equivalent. L5

CHNS 171b, Introduction to Literary Chinese II Pauline Lin

Continuation of CHNS 170. After CHNS 170. L5

EALL 200a / CHNS 200a / EAST 240a / HUMS 270a, The Chinese Tradition Lucas Bender

An introduction to the literature, culture, and thought of premodern China, from the beginnings of the written record to the turn of the twentieth century. Close study of textual and visual primary sources, with attention to their historical and cultural backdrops. Students enrolled in CHNS 200 join a weekly Mandarin-language discussion section. No knowledge of Chinese required for students enrolled in EALL 200. Students enrolled in CHNS 200 must have L5 proficiency in Mandarin or permission of the course instructor. HU TR

EALL 211a / EAST 241a / LITR 174a / WGSS 405a, Women and Literature in Traditional China Kang-i Sun Chang

A study of major women writers in traditional China, as well as representations of women by male authors. The power of women's writing; women and material culture; women in exile; courtesans; Taoist and Buddhist nuns; widow poets; cross-dressing women; the female body and its metaphors; footbinding; notions of love and death; the aesthetics of illness; women and revolution; poetry clubs; the function of memory in women's literature; problems of gender and genre. All readings in translation; no knowledge of Chinese required. Some Chinese texts provided for students who read Chinese. Formerly CHNS 201. HU TR

EALL 212a / PHIL 203a, Ancient Chinese Thought Michael Hunter

An introduction to the foundational works of ancient Chinese thought from the ruling ideologies of the earliest historical dynasties, through the Warring States masters, to the Qin and Han empires. Topics include Confucianism and Daoism, the role of the intellectual in ancient Chinese society, and the nature and performance of wisdom. HU

* **EALL 303b, Readings in Classical Chinese Poetry** Kang-i Sun Chang

Study of successive appropriations and reorientation of Chinese poetic forms in the major genres, such as song lyric (*ci*) and vernacular lyric (*qu*) traditions, traced from early foundations to those written in later times. Topics include the creation of cultural values and identities, problems of authorship and authority, exile and poetic writing, reception, and material culture. Readings in Chinese; discussion in English. Prerequisite: CHNS 171 or equivalent, or permission of instructor. Formerly CHNS 303. HU

EALL 308b / HUMS 305b / PHIL 410b, Sages of the Ancient World Michael Hunter

Comparative survey of ancient discourses about wisdom from China, India, the Near East, Egypt, Greece, and Rome. Topics include teaching, scheming, and dying. HU

HIST 101a, The World Circa 1000 Valerie Hansen and Anders Winroth

A study of the world's major societies and the encounters among them circa 1000, when globalization began. Attention to China, India, Europe, the Vikings, Africa, the Islamic world, Amerindians including the Maya. Analysis of written and archaeological sources.

HU

*** HIST 307Ja / EAST 404a, The Written Word in Japan, Prehistory to 1600** Staff

In premodern Japan, text and writing had the power to imbue swords with ritual meaning, evoke the pathos of cherry blossoms, or reveal means of salvation. People from all walks of life produced and consumed the written word in different ways, whether they hoped to shape military regimes or simply send messages to loved ones, as we might today. In what ways did textuality (or, in some cases, its absence or conscious rejection) shape Japan's social, political, economic, and religious development? What is a "text"? How does understanding its use by diverse peoples across centuries challenge our underlying assumptions about how documents, writing, and communication function in society? Surveying these issues from prehistory to 1600, this course uses writing traditions and documentary culture as a lens through which to understand Japanese history and ways of being in Japan's premodern world. Students use primary and secondary readings to discuss core issues in writing and textual culture, such as language, orality, transmission, translation, gender, genre, communication, and visibility. A complementary emphasis on how we, as modern readers, writers, and scholars, interpret and use written materials further provides students with new strategies for thinking about how history is recorded, consumed, and evaluated. No previous knowledge of Japanese or Japanese history is required. HU

HIST 321b / EAST 220b, China from Present to Past, 2015–600 Valerie Hansen

Underlying causes of current issues facing China traced back to their origins in the premodern period. Topics include economic development, corruption, environmental crises, gender, and Pacific island disputes. Selected primary-source readings in English, images, videos, and Web resources. *Optional additional Chinese-language and English-language sections. HU

HSAR 143a / RLST 188a / SAST 260a, Introduction to the History of Art: Buddhist Art and Architecture, 900 to 1600 Mimi Yiengpruksawan

Buddhist art and architecture of East Asia, Southeast Asia, and Tibet from the tenth century to the early modern period. Emphasis on cross-regional engagements including the impact of Islam. HU

MODERN PERIOD*** ANTH 342a, Cultures and Markets in Asia** Helen Siu

Historical and contemporary movements of people, goods, and cultural meanings that have defined Asia as a region. Reexamination of state-centered conceptualizations of Asia and of established boundaries in regional studies. The intersections of transregional institutions and local societies and their effects on trading empires, religious traditions, colonial encounters, and cultural fusion. Finance flows that connect East Asia and the Indian Ocean to the Middle East and Africa. The cultures of capital and market in the neoliberal and postsocialist world. SO

*** ARCH 341b / GLBL 253b / LAST 318b, Globalization Space** Keller Easterling

Infrastructure space as a primary medium of change in global polity. Networks of trade, energy, communication, transportation, spatial products, finance, management, and

labor, as well as new strains of political opportunity that reside within their spatial disposition. Case studies include free zones and automated ports around the world, satellite urbanism in South Asia, high-speed rail in Japan and the Middle East, agripoles in southern Spain, fiber optic submarine cable in East Africa, spatial products of tourism in North Korea, and management platforms of the International Organization for Standardization. HU

EALL 255b / EAST 252b, Japanese Modernism Seth Jacobowitz

Japanese literature and art from the 1920s through the 1940s. The avant-garde and mass culture; popular genre fiction; the advent of new media technologies and techniques; effects of Japanese imperialism, militarism, and fascism on cultural production; experimental writers and artists and their resistance to, or complicity with, the state. HU

* **EALL 281a / FILM 304a, Japanese Cinema and Its Others** Aaron Gerow

Critical inquiry into the myth of a homogeneous Japan through analysis of how Japanese film and media historically represents “others” of different races, ethnicities, nationalities, genders, and sexualities, including blacks, ethnic Koreans, Okinawans, Ainu, undocumented immigrants, LGBT minorities, the disabled, youth, and monstrous others like ghosts. HU

* **EALL 286a / EAST 261a / HUMS 290a / LITR 285a / PORT 360a, The Modern Novel in Brazil and Japan** Seth Jacobowitz

Brazilian and Japanese novels from the late nineteenth century to the present. Representative texts from major authors are read in pairs to explore their commonalities and divergences. Topics include nineteenth-century realism and naturalism, the rise of mass culture and the avant-garde, and existentialism and postmodernism. No knowledge of Portuguese or Japanese required. HU TR

* **EALL 300a / EAST 340a, Sinological Methods** Pauline Lin

A research course in Chinese studies, designed for students with background in modern and literary Chinese. Exploration and evaluation of the wealth of primary sources and research tools available in Chinese. For native speakers of Chinese, introduction to the secondary literature in English and instruction in writing professionally in English on topics about China. Topics include the compilation and development of Chinese bibliographies; bibliophiles' notes; editions, censorship, and textual variation and reliability; specialized dictionaries; maps and geographical gazetteers; genealogies and biographical sources; archaeological and visual materials; and major Chinese encyclopedias and compendia. Prerequisite: CHNS 171 or equivalent. Formerly CHNS 202. HU

* **EALL 325a, Chinese Poetic Form, 1490–1990** Kang-i Sun Chang

Development of the classical Chinese poetic form by modern Chinese poets. The appeal and aesthetic concept of the classical form since the revivalist movement of the late fifteenth century. Emphasis on close critical reading, with attention to cultural and political contexts. Readings in Chinese; discussion in English. Prerequisite: a literary Chinese course or permission of instructor. HU

* **GLBL 312b / EAST 454b / ECON 474b, Economic and Policy Lessons from Japan**
Stephen Roach

An evaluation of modern Japan's protracted economic problems and of their potential implications for other economies, including the United States, Europe, and China.

Policy blunders, structural growth impediments, bubbles, the global economic crisis of 2008, and Abenomics; risks of secular stagnation and related dangers to the global economy from subpar post-crisis recoveries. Focus on policy remedies to avert similar problems in other countries. Prerequisite: an introductory course in macroeconomics. SO

GLBL 318a / EAST 338a / ECON 338a, The Next China Stephen Roach

Economic development in China since the late 1970s. Emphasis on factors pushing China toward a transition from its modern export- and investment-led development model to a pro-consumption model. The possibility of a resulting identity crisis, underscored by China's need to embrace political reform and by the West's long-standing misperceptions of China. Prerequisite: introductory macroeconomics. SO

HIST 303b, Japan's Modern Revolution Daniel Botsman

A survey of Japan's transformation over the course of the nineteenth century from an isolated, traditional society on the edge of northeast Asia to a modern imperial power. Aspects of political, social, and cultural history. HU

* **PLSC 162b, Japan and the World** Frances Rosenbluth

The historical development of Japan's international relations since the late Tokugawa period; World War II and its legacy; domestic institutions and foreign policy; implications for the United States; and interactions between nationalism and regionalism. SO

Ecology and Evolutionary Biology

Director of undergraduate studies: Stephen Stearns
(stephen.stearns@yale.edu); eeb.yale.edu

The Department of Ecology and Evolutionary Biology (EEB) offers broad education in the biological sciences. The subject matter includes molecules, cells, organs, organisms, and ecosystems and the evolutionary processes that shape them. The department offers a B.A. and a B.S. degree. The B.A. program is intended for students who are interested in ecology, evolution, and organismal diversity as part of a liberal education but do not intend to pursue graduate work in the discipline. The B.S. program is designed for students planning to attend medical or veterinary school or to pursue graduate study in ecology and evolutionary biology, other biological disciplines, or the environmental sciences. The two programs share the same prerequisites and core requirements but differ in their electives and senior requirements.

Students majoring in EEB select one of two tracks. The requirements for track 1 emphasize courses appropriate for careers in ecology, evolutionary biology, and environmental science; track 2 is most appropriate for premedical and preveterinary students because it allows them to use as electives many courses required by medical schools. The EEB major offers opportunities for independent research in both laboratory-based and field-based scientific investigations.

COURSES FOR NONMAJORS

Several EEB courses have no college-level prerequisites and are suitable for nonmajors. These include all 100-level offerings as well as 200-level courses that deal with particular organism groups such as plants, fish, mammals, birds, insects, or other invertebrates.

PREREQUISITES

The prerequisites for the major are intended to provide core scientific literacy; they include courses in biology, chemistry, physics, and mathematics. The introductory biology sequence BIOL 101, 102, 103, and 104 is required. Also required are a two-term lecture sequence in general chemistry, CHEM 161, 165 or CHEM 163, 167, taken with associated laboratories, CHEM 134L and 136L, and one term of organic chemistry, CHEM 174 or 175, or CHEM 220 or 221, with associated laboratories, CHEM 222L or 223L. Optionally, CHEM 174, 175, taken with CHEM 222L, 223L, satisfies the chemistry requirement. Two terms of physics are required, PHYS 170, 171 or higher, and one term of mathematics, MATH 115 or higher (not MATH 190), or S&DS 101-106. A different statistics course approved by the director of undergraduate studies (DUS) may be substituted for the mathematics prerequisite.

A new online program, ONEXYS for Physics, will be offered in the summer by the Mathematics and Physics departments and by the Center for Teaching and Learning, to review math skills needed in preparation for introductory physics courses.

Acceleration credit awarded in chemistry, mathematics, and physics, or completion of advanced courses in those departments, may be accepted in place of the corresponding prerequisites for the EEB major. Students who have mathematics preparation equivalent to MATH 115 or higher are encouraged to take a statistics course (most often

S&DS 101–106) and/or additional mathematics or statistics courses such as MATH 120, 121, 222, or 225 and S&DS 220 or 230. Because chemistry courses are prerequisite to several EEB courses, students are strongly urged to take general and organic chemistry in the first and sophomore years. Students who place out of general chemistry should take organic chemistry during their first year. Finishing the prerequisites early allows for a more flexible program in later years.

PLACEMENT PROCEDURES

Students can place out of the introductory biology sequence (BIOL 101, 102, 103, 104) only by means of the biology placement examination administered jointly by the biological science departments, EEB, MB&B, and MCDB.

Potential EEB majors are expected to take the mathematics placement test. Those who place above the level of MATH 112 may proceed to prerequisite courses for the EEB major; those who place into MATH 112 must take calculus before other prerequisites.

For information about placement examinations, refer to the *Calendar for the Opening Days of College* and the First-Year Handbook, Biology. The Chemistry department arranges placement in chemistry courses.

REQUIREMENTS OF THE MAJOR

B.A. degree program Beyond the prerequisites, the B.A. requires three lecture courses and one laboratory, for three and one-half course credits, and the senior requirement. In track 1, the required courses are E&EB 220, 225, and a lecture course on organismal diversity chosen from E&EB 246–272, along with its associated laboratory. Required courses in track 2 include E&EB 290, E&EB 295 or BENG 350, MCDB 300; and E&EB 291L.

B.S. degree program The B.S. requirements are the same as those for the B.A., with the addition of at least two electives, for two course credits, in either track 1 or track 2. At least one of the electives must be a lecture or a seminar. Most EEB, MCDB, or MB&B courses numbered 200 or above qualify as electives, as do most research courses and laboratories in a biological sciences department or in the Yale School of Medicine. Courses from other departments may qualify with permission of the DUS.

Substitutions permitted Two upper-level courses in Geology and Geophysics (excluding paleobiology courses), Mathematics, Computer Science, or Engineering and Applied Science can be substituted for the required term of organic chemistry and laboratory. A second term of organic chemistry and laboratory and up to two terms of physics laboratories are allowed as electives. Courses from other departments may also be suitable as electives. All substitutions require the permission of the DUS. College seminars may not be counted toward the requirements of the major.

Limit on research courses While independent research courses may be taken multiple times for credit, there are restrictions on the number of such courses that can be included in a student's curriculum. See Academic Regulations, section C, Course Credits and Course Loads. Interested sophomores and juniors can take E&EB 469 and E&EB 474.

Credit/D/Fail No course taken Credit/D/Fail may be counted toward the EEB major, including prerequisites.

Roadmap See visual roadmap of the requirements.

SENIOR REQUIREMENT

B.A. degree program Students in the B.A. degree program fulfill the senior requirement either by completing one term of independent study in E&EB 470 or by writing a senior essay. The senior essay may be related to the subject matter of a course, but the senior essay is a separate departmental requirement in addition to any work done in a course and does not count toward the grade in any course. Students intending to write a senior essay must obtain an approval form from the office of the director of undergraduate studies and have it signed by the senior essay adviser before the end of the course selection period. Senior essays must be submitted to the DUS by the last day of classes.

B.S. degree program for the Class of 2020 and Class of 2021 With DUS approval, students may follow the senior requirements in place when they declared their major or they may complete two terms of original research in E&EB 475, 476, 495, or 496.

B.S. degree program for the Class of 2022 and subsequent classes Students in the B.S. degree program fulfill the senior requirement by completing two terms of original research in E&EB 475, 476, 495, or 496.

ADVISING

First-year students considering a major in Ecology and Evolutionary Biology are invited to consult with the DUS. After the first year, students should choose an adviser from the department faculty who has interests comparable to their own and/or is a fellow of their residential college. For additional information, visit the EEB website. Students in EEB should consult one of the advisers assigned to their class (see below). The course schedules of all EEB majors (including sophomores intending to major in EEB) must be signed by a faculty member in EEB; the signature of the DUS is not required. Students whose regular adviser is on leave can consult the DUS to arrange for an alternate.

Class of 2020: Casey Dunn

Class of 2021: Adalgisa Caccone and Rick Prum

Class of 2022: Marta Wells and David Vasseur

Class of 2023: Stephen Stearns

Graduate courses of interest to undergraduates Graduate courses in the biological and biomedical sciences that may be of interest to undergraduates are listed in the Graduate School online bulletin, and many are posted on the Biological and Biomedical Sciences website. Additional information is available from the DUS and the director of graduate studies. Undergraduates with an appropriate background may enroll with the permission of the director of graduate studies and the instructor.

STUDY ABROAD

Participation in study abroad field programs is encouraged. Credit for such programs may apply toward the major; interested students should consult the DUS prior to going abroad.

REQUIREMENTS OF THE MAJOR

Prerequisites Introductory biology sequence (BIOL 101, 102, 103, 104); 2-term general chemistry lecture sequence (CHEM 161, 165 or CHEM 163, 167) with labs (CHEM 134L, 136L); 1 term of organic chemistry (CHEM 174 or 175, or CHEM 220 or 221) with labs (CHEM 222L or 223L); CHEM 174, 175 taken with CHEM 222L, 223L satisfies both chemistry requirements; 2 terms of physics (PHYS 170, 171 or higher); 1 term of MATH 115 or higher (not MATH 190) or S&DS 101–106

Number of courses *B.A.* – 3½ course credits beyond prereqs (not incl senior req);
B.S. – 5½ course credits beyond prereqs (not incl senior req)

Specific courses required *Track 1* – E&EB 220, 225; 1 from E&EB 246–272, with lab;
Track 2 – E&EB 290, E&EB 295 or BENG 350, MCDB 300; and E&EB 291L

Distribution of courses *B.S.* – 2 electives as specified

Substitutions permitted With DUS permission: other stat course for math or stat prereq; two upper-level courses in G&G, MATH, CPSC, or ENAS for organic chemistry and lab; the second term of organic chemistry and lab and two physics labs for electives

Senior requirement *B.A.* – E&EB 470 or senior essay; *B.S.* – two terms of E&EB 475, 476, 495, or 496

FACULTY OF THE DEPARTMENT OF ECOLOGY AND EVOLUTIONARY BIOLOGY

Professors †Richard Bribiescas, †Nicholas Christakis, Michael Donoghue, Casey Dunn, Erika Edwards, †Alison Galvani, †Vivian Irish, Walter Jetz, Thomas Near (*Chair*), David Post, Jeffrey Powell, Richard Prum, †Eric Sargis, †Oswald Schmitz, †David Skelly, Stephen Stearns, †Jeffrey Townsend, Paul Turner, †J. Rimas Vaišnys, Günter Wagner

Associate Professors †Liza Comita, †Forrest Crawford, †James Noonan, David Vasseur

Assistant Professors †Craig Brodersen, Alvaro Sanchez, Carla Staver

Senior Lecturer Marta Martínez Wells

Lecturers Adalgisa Caccone, Linda Puth

†A joint appointment with primary affiliation in another department or school.

Introductory Courses

* E&EB 106a / HLTH 155a / MCDB 106a, **Biology of Malaria, Lyme, and Other Vector-Borne Diseases** Alexia Belperron

Introduction to the biology of pathogen transmission from one organism to another by insects; special focus on malaria, dengue, and Lyme disease. Biology of the pathogens including modes of transmission, establishment of infection, and immune responses; the challenges associated with vector control, prevention, development of vaccines, and treatments. Intended for non-science majors; preference to freshmen and sophomores. Prerequisite: high school biology. sc

E&EB 115a / F&ES 315a, Conservation Biology Linda Puth

An introduction to ecological and evolutionary principles underpinning efforts to conserve Earth's biodiversity. Efforts to halt the rapid increase in disappearance of both plants and animals. Discussion of sociological and economic issues. SC

* **E&EB 125b / G&G 125b, History of Life** Derek Briggs, Pincelli Hull, and Bhart-Anjan Bhullar

Examination of fossil and geologic evidence pertaining to the origin, evolution, and history of life on Earth. Emphasis on major events in the history of life, on what the fossil record reveals about the evolutionary process, on the diversity of ancient and living organisms, and on the evolutionary impact of Earth's changing environment. SC

* **E&EB 145b, Plants and People** Linda Puth

The interaction of plants and people throughout history explored from biological, historical, anthropological, and artistic perspectives. Basic botany; plants in the context of agriculture; plants as instruments of trade and societal change; plants as inspiration; plants in the environment. Includes field trips to the greenhouses at Yale Marsh Botanical Garden, the Yale Peabody Museum and Herbarium, the Yale Farm, and the Yale Art Gallery. SC

* **E&EB 175Lb, Virus Discovery and Evolution** Alita Burmeister

An inquiry-based, hands-on introduction to sampling bacteriophages (bacteria-specific viruses) from natural environments. Emphasis on lab methods to characterize viruses via growth assays and genome sequencing, and to experimentally evolve viruses on bacteria. Readings and discussion on virus biodiversity, role of viruses in the environment, and virus applications to solve human problems. SC ½ Course cr

E&EB 210a / S&DS 101a, Introduction to Statistics: Life Sciences Jonathan Reuning-Scherer

Statistical and probabilistic analysis of biological problems, presented with a unified foundation in basic statistical theory. Problems are drawn from genetics, ecology, epidemiology, and bioinformatics. QR

E&EB 246a, Plant Diversity and Evolution Erika Edwards

Introduction to the major plant groups and their evolutionary relationships, with an emphasis on the diversification and global importance of flowering plants. To be taken concurrently with E&EB 247L. Prerequisite: a general understanding of biology and evolution. SC

E&EB 247La, Laboratory for Plant Diversity and Evolution Erika Edwards

Hands-on experience with the plant groups examined in the accompanying lectures. Local field trips. To be taken concurrently with E&EB 246. SC ½ Course cr

E&EB 250a, Biology of Terrestrial Arthropods Marta Wells

Evolutionary history and diversity of terrestrial arthropods (body plan, phylogenetic relationships, fossil record); physiology and functional morphology (water relations, thermoregulation, energetics of flying and singing); reproduction (biology of reproduction, life cycles, metamorphosis, parental care); behavior (migration, communication, mating systems, evolution of sociality); ecology (parasitism, mutualism, predator-prey interactions, competition, plant-insect interactions). To be taken concurrently with E&EB 251L. SC

E&EB 251La, Laboratory for Biology of Terrestrial Arthropods Marta Wells
Comparative anatomy, dissections, identification, and classification of terrestrial arthropods; specimen collection; field trips. Concurrently with or after E&EB 250. SC
½ Course cr

[E&EB 264, Ichthyology]

[E&EB 265L, Laboratory for Ichthyology]

[E&EB 272, Ornithology]

[E&EB 273L, Laboratory for Ornithology]

Intermediate and Advanced Courses

Prerequisites for all intermediate and advanced E&EB courses are BIOL 101, 102, 103, and 104, or permission of the instructor.

E&EB 220a / EVST 223a, General Ecology David Vasseur and Ann Staver
The theory and practice of ecology, including the ecology of individuals, population dynamics and regulation, community structure, ecosystem function, and ecological interactions at broad spatial and temporal scales. Topics such as climate change, fisheries management, and infectious diseases are placed in an ecological context. Prerequisite: MATH 112 or equivalent. SC

E&EB 223Lb, Evolution, Functional Traits, and the Tree of Life Marta Wells
Study of evolutionary novelties, their functional morphology, and their role in the diversity of life. Introduction to techniques used for studying the diversity of animal body plans. Evolutionary innovations that have allowed groups of organisms to increase their diversity. SC ½ Course cr

E&EB 225b, Evolutionary Biology Paul Turner
An overview of evolutionary biology as the discipline uniting all of the life sciences. Reading and discussion of scientific papers to explore the dynamic aspects of evolutionary biology. Principles of population genetics, paleontology, and systematics; application of evolutionary thinking in disciplines such as developmental biology, ecology, microbiology, molecular biology, and human medicine. SC

[E&EB 228, Ecology and Evolution of Infectious Diseases]

[E&EB 230, Field Ecology]

* **E&EB 235a / HLTH 250a, Evolution and Medicine** Stephen Stearns
Introduction to the ways in which evolutionary science informs medical research and clinical practice. Diseases of civilization and their relation to humans' evolutionary past; the evolution of human defense mechanisms; antibiotic resistance and virulence in pathogens; cancer as an evolutionary process. Students view course lectures on line; class time focuses on discussion of lecture topics and research papers. Prerequisite: BIOL 101–104. WR, SC

E&EB 255a / G&G 316, Invertebrates Casey Dunn
An overview of animal diversity that explores themes including animal phylogenetics (evolutionary relationships), comparative studies of evolutionary patterns across species, organism structure and function, and the interaction of organisms with their environments. Most animal lineages are marine invertebrates, so marine invertebrates

are the focus of most of the course. E&EB 256L is not required to enroll in the lecture.

SC

E&EB 256La, Laboratory for Invertebrates Casey Dunn

The study of invertebrate anatomy and diversity in a laboratory and field setting. Activities will include will examine live animals and museum specimens, as well as local field trips. Some field trips will fall on weekends. This lab must be taken concurrently with the lecture E&EB 255. SC ½ Course cr

* **E&EB 275b / EVST 400b, Biological Oceanography** Mary Beth Decker

Exploration of a range of coastal and pelagic ecosystems. Relationships between biological systems and the physical processes that control the movements of water and productivity of marine systems. Anthropogenic impacts on oceans, such as the effects of fishing and climate change. Includes three Friday field trips. Enrollment limited to 15.

SC

E&EB 290b, Comparative Developmental Anatomy of Vertebrates Günter Wagner

A survey of the development, structure, and evolution of major vertebrate groups. Topics include the micro-anatomy of major organ systems, the developmental underpinnings of the vertebrate body plan, and the development, structure, and evolution of the major organ systems such as the locomotory system, sensory organs, digestive tract, reproductive tract, and nervous system. SC

* **E&EB 291Lb, Comparative Anatomy of Vertebrates Laboratory** Staff

Microscopic examination of histological and embryological preparations. Dissection of selected vertebrate species including shark, bony fish, frog, lizard, and rat. To be taken with E&EB 290. SC ½ Course cr

E&EB 295a, Comparative Physiology Staff

Comparative focus on vertebrate animals and how individual organisms survive in their environments and how species deal with common problems (respiration, energy acquisition, reproduction) using similar, or sometimes very different, tools. Additional topics include specialized adaptations to extreme environments from high altitude to the deep seas and physiological mechanisms that facilitate survival at multiple levels: cells, tissues, organs, systems, and whole organisms. Prerequisites: BIOL 101, 102 and CHEM 161, or permission of the instructor. SC

E&EB 300a / ANTH 300a / EVST 182a, Primate Behavior and Ecology Eduardo

Fernandez-Duque

Socioecology of primates compared with that of other mammals, emphasizing both general principles and unique primate characteristics. Topics include life-history strategies, feeding ecology, mating systems, and ecological influences on social organization. SC, SO

[**E&EB 305, Plant Ecology**]

E&EB 320b, Advanced Ecology David Vasseur

An advanced treatment of ecology, including species interactions, species coexistence theory, species-environment interactions, the maintenance and consequences of biological diversity, spatial ecology, food webs, and eco-evolutionary interactions. Prerequisites: E&EB 220 and 225, or with permission of instructor. SC

* **E&EB 321a, Philosophy of Biology** Casey Dunn and Günter Wagner

This course is an introduction to the philosophy of biology, with application to specific current problems. It focuses on two major strands of thinking seeking answers to fundamental and complementary questions: “How do we know?” (epistemology) and “What things really exist in the world?” (ontology). These two themes have the most important impact on the practice of science, as they pertain to the nature of the scientific enterprise and how it works (epistemology and philosophy of science), as well as what scientists consider part of reality (=science related ontology: unicorns and phlogiston NO; atoms, electrons, YES; but what about species and genes? Do they have the same status as atoms?). In each of these fields of philosophy we outline the main positions and then discuss how they apply to past and current debates in biology, in particular, but not exclusively, evolutionary biology. Prerequisite: a semester of biology or a semester of philosophy. HU

E&EB 325a / E&EB 625a, Limnology David Post

Limnology, the study of the physical, chemical, and biological properties of inland waters, focuses on lakes where physical (light, temperature, and mixing) and chemical (dissolved elements and compounds) properties interact with the ecology and evolution of organisms. Topics include origins and morphology of inland waters; physical and chemical properties; diversity and interactions among the organisms found in lakes; historical perspectives; and understanding conservation and management in the context of global change. Frequent field trips to local freshwater ecosystems. Prerequisites: E&EB 220 and E&EB 225, or with permission of instructor. SC

[**E&EB 326, Plant Structure and Function**]

[**E&EB 327L, Plant Structure and Function Lab**]

* **E&EB 336b / HSHM 453b / HUMS 336b, Culture and Human Evolution** Gary Tomlinson

Examination of the origins of human modernity in the light of evolutionary and archaeological evidence. Understanding, through a merger of evolutionary reasoning with humanistic theory, the impact of human culture on natural selection across the last 250,000 years. HU, SC

* **E&EB 380b, Life History Evolution** Stephen Stearns

Life history evolution studies how the phenotypic traits directly involved in reproductive success are shaped by evolution to solve ecological problems. The intimate interplay between evolution and ecology. After E&EB 220 and 225, or with permission of instructor. WR, SC

E&EB 428a / AMTH 428a / G&G 428a / PHYS 428a, Science of Complex Systems Jun Korenaga

Introduction to the quantitative analysis of systems with many degrees of freedom. Fundamental components in the science of complex systems, including how to simulate complex systems, how to analyze model behaviors, and how to validate models using observations. Topics include cellular automata, bifurcation theory, deterministic chaos, self-organized criticality, renormalization, and inverse theory. Prerequisite: PHYS 301, MATH 247, or equivalent. QR, SC

E&EB 464b / ANTH 464b / ARCG 464b, Human Osteology Eric Sargis

A lecture and laboratory course focusing on the characteristics of the human skeleton and its use in studies of functional morphology, paleodemography, and paleopathology.

Laboratories familiarize students with skeletal parts; lectures focus on the nature of bone tissue, its biomechanical modification, sexing, aging, and interpretation of lesions.
SC, SO

*** E&EB 469a or b, Tutorial** Marta Wells

Individual or small-group study for qualified students who wish to investigate an area of ecology or evolutionary biology not presently covered by regular courses. A student must be sponsored by a faculty member who sets requirements and meets weekly with the student. One or more written examinations and/or a term paper are required. To register, the student must submit a written plan of study approved by the faculty instructor to the director of undergraduate studies. Students are encouraged to apply during the term preceding the tutorial. Proposals must be submitted no later than the first day of the second week of the term in which the student enrolls in the tutorial. The final paper is due in the hands of the director of undergraduate studies by the last day of reading period in the term of enrollment. In special cases, with approval of the director of undergraduate studies, this course may be elected for more than one term, but only one term may be counted as an elective toward the requirements of the major. Normally, faculty sponsors must be members of the EEB department.

*** E&EB 470a or b, Senior Tutorial** Marta Wells

Tutorial for seniors in the B.A. degree program who elect a term of independent study to complete the senior requirement. A thesis, fifteen to twenty pages in length, is required. A student must be sponsored by a faculty member who sets requirements and meets weekly with the student. To register, the student must submit a written plan of study approved by the faculty instructor to the director of undergraduate studies. Students are encouraged to apply during the term preceding the tutorial. Proposals must be submitted no later than the first day of the second week of the term in which the student enrolls in the tutorial. The final paper is due in the hands of the director of undergraduate studies by the last day of reading period in the term of enrollment. Normally, faculty sponsors must be members of the EEB department. Enrollment limited to seniors. Fulfills the senior requirement for the B.A. degree.

*** E&EB 474a or b, Research** Marta Wells

One term of original research in an area relevant to ecology or evolutionary biology. This may involve, for example, laboratory work, fieldwork, or mathematical or computer modeling. Students may also work in areas related to environmental biology such as policy, economics, or ethics. The research project may not be a review of relevant literature but must be original. In all cases students must have a faculty sponsor who oversees the research and is responsible for the rigor of the project. Students are expected to spend ten hours per week on their research projects. Using the form available from the office of undergraduate studies or from the Canvas, students must submit a research proposal that has been approved by the faculty sponsor to the director of undergraduate studies, preferably during the term preceding the research. Proposals are due no later than the first day of the second week of the term in which the student enrolls in the course. The final research paper is due in the hands of the director of undergraduate studies by the last day of reading period in the term of enrollment.

*** E&EB 475a and E&EB 476b, Senior Research** Marta Wells

One term of original research in an area relevant to ecology or evolutionary biology. This may involve, for example, laboratory work, fieldwork, or mathematical or computer modeling. Students may also work in areas related to environmental biology

such as policy, economics, or ethics. The research project may not be a review of relevant literature but must be original. In all cases students must have a faculty sponsor who oversees the research and is responsible for the rigor of the project. Students are expected to spend ten hours per week on their research projects. Using the form available from the office of undergraduate studies or from the Canvas, students must submit a research proposal that has been approved by the faculty sponsor to the director of undergraduate studies, preferably during the term preceding the research. Proposals are due no later than the first day of the second week of the term in which the student enrolls in the course. The final research paper is due in the hands of the director of undergraduate studies by the last day of classes in the term of enrollment. Fulfills the senior requirement for the B.S. degree. Enrollment limited to seniors.

*** E&EB 495a and E&EB 496b, Intensive Senior Research** Marta Wells

One term of intensive original research during the senior year under the sponsorship of a Yale faculty member. Similar to other research courses except that a more substantial portion of a student's time and effort should be spent on the research project (a minimum average of twenty hours per week). A research proposal approved by the sponsoring faculty member must be submitted to the director of undergraduate studies; forms are available from the office of undergraduate studies. For research in the fall term, approval is encouraged during the spring term of the junior year. Proposals are due no later than the first day of the second week of the term in which the student enrolls in the course. The final research paper is due in the hands of the director of undergraduate studies by the last day of reading period in the term of enrollment. One term of intensive research fulfills a portion of the senior requirement for the B.S. degree. 2 Course cr per term

Economics

Director of undergraduate studies: Ebonya Washington

(ebonya.washington@yale.edu), Rm. 36, 37 Hillhouse Ave., 432-9901; registrar:
Qazi Azam, (qazi.azam@yale.edu) Room 101A, 28 Hillhouse Ave., 432-3574;
economics.yale.edu/undergraduate-program

Economics is much broader than the study of recessions and inflation or stocks and bonds. Economists study decision making and incentives such as how taxes create incentives for labor market and savings behavior. Many current public policy debates concern questions of economics, including: causes and consequences of inequality and gender and racial wage gaps; how to address poverty; the impact of immigration and trade on the well-being of a country's citizens; the cause of the Great Recession; and how to predict future downturns.

Those with economics training find employment in government agencies, nonprofits, and, of course, economic consulting and investment banking. In addition to pursuing advanced degrees in economics, economics majors also go on to do graduate work in law, medicine, and business.

INTRODUCTORY COURSES

Introductory courses in microeconomics, macroeconomics, and data analysis and econometrics serve students considering a major in Economics, as well as others who seek an introduction to the subject. ECON 115 is concerned with microeconomics and includes such topics as markets, prices, production, distribution, and the allocation of resources. ECON 116 covers such macroeconomic issues as unemployment, inflation, growth, and international economics. ECON 117 introduces students to basic aspects of working with data to answer economic questions, as well as to the fundamentals of statistical analysis. ECON 116 and 117 have microeconomics as a prerequisite.

Despite the numbering, students may wish to take ECON 117 before or concurrently with ECON 116, as the data skills taught in ECON 117 may be helpful in ECON 116. ECON 115, 116, and 117 are lecture courses with accompanying discussion sections.

First-year students and sophomores looking for smaller, slightly more discussion-oriented versions of introductory microeconomics and macroeconomics may enter a lottery for admission to ECON 110 and 111. Those with little or no experience in calculus may be better served by ECON 108, which covers microeconomics with greater discussion of quantitative methods and examples. ECON 108, 110, and 115 are similar in substance; ECON 111 and 116 are similar in substance as well. A student may receive credit for only one course each in introductory microeconomics and introductory macroeconomics.

The department recommends that students interested in majoring in Economics take at least two introductory economics courses in the first year. In order to make the introductory courses available to all first-year students and to students majoring in other subjects, the introductory courses do not have a mathematics requirement.

PLACEMENT AND EXEMPTIONS FOR INTRODUCTORY COURSES

In the summer before they enter, all first-year students receive, through the University's electronic bulletin board, a personalized recommendation for a first course in

economics, based on application data and AP (or equivalent) exam scores. In general, students who receive a score of 5 on the Microeconomics or Macroeconomics AP exam *and* a score of 5 on the AP Calculus BC exam are allowed to place out of the corresponding introductory course and instead enroll in intermediate-level courses (ECON 121 or 125 for microeconomics, ECON 122 or 126 for macroeconomics). Students who have the requisite AP Economics score but not the corresponding AP Calculus score may take calculus (e.g., MATH 112, MATH 115, 118, or 120), and then place out of the corresponding introductory economics course. Students may substitute a score of 7 on the International Baccalaureate higher-level Economics examination or A on the GCE A-level Economics examination for AP test scores of 5 in economics. In addition, a score of 7 on the International Baccalaureate higher-level Mathematics examination or A on the GCE A-level Mathematics examination may be substituted for a qualifying AP Calculus score.

Because of its emphasis on data manipulation, the department recommends that even students with a background in statistics should begin their econometrics and data analysis training with ECON 117.

REQUIREMENTS OF THE MAJOR

Students majoring in Economics are required to take twelve term courses. Three of these are the introductory courses, one in microeconomics, one in macroeconomics, and one in data analysis and econometrics. All majors must take the following courses: one term of intermediate microeconomics (ECON 121 or 125) and one term of intermediate macroeconomics (ECON 122 or 126); and one Yale mathematics course, usually selected from MATH 112, 115, 118, or 120. ENAS 151 may also be used to meet the math requirement. The department recommends that students also take ECON 123, a course in econometrics and data analysis at the intermediate level. All of the aforementioned required courses should be completed prior to the senior year. Majors must also take two courses numbered ECON 400–491, at least one of which must be taken in the senior year.

Subject to approval by the director of undergraduate studies (DUS), students may count toward the major one course related to economics but taught in another field, in addition to the required course in mathematics.

Mathematics Students are advised to meet the mathematics requirement for the major during their first year. To fulfill the requirement, the department recommends that majors take MATH 118 or 120. Students who place out of these mathematics courses must take a higher-level mathematics course at Yale and should consult the DUS for help choosing a course. Students who intend to pursue a graduate degree in economics should take additional math courses, including linear algebra (MATH 222 or 225) and real analysis (MATH 300 or 301).

Data analysis and econometrics Students are strongly advised to take a two-term sequence of data analysis and econometrics courses, especially if they are considering writing a senior essay or are interested in research experience on or off campus. The statistical analysis of economic data has become central to the work of economists, and the ability to analyze large data sets is a skill that will serve students in the job market both inside and outside of academia. Most students should take ECON 117, followed by 123. Students with a stronger mathematics background, who prefer a

more theoretical treatment of the material or who plan to pursue a graduate degree in economics, are encouraged to take either ECON 135 or S&DS 241 and S&DS 242, followed by ECON 136. (Note: S&DS 241 and 242 together count as one course towards the economics major.) Prospective majors are urged to start their econometrics sequence by the fall of sophomore year.

Intermediate microeconomics and macroeconomics Two course options are available in both microeconomics and macroeconomics. The standard intermediate courses are ECON 121 and 122. Students with a stronger mathematics background are encouraged to take ECON 125 and 126 instead. The intermediate courses need not be taken in sequence: in particular, ECON 125 is not required for 126.

Field courses The department offers a wide selection of upper-level courses that explore in greater detail material presented in introductory courses. Advanced fields of economics include theoretical, quantitative, and mathematical economics; market organization; human resources; finance; international and development economics; public policy and the public sector; health; labor; poverty; environmental economics; and economic history. Some field courses have no prerequisites or only introductory microeconomics as a prerequisite. Others apply intermediate-level theory or econometrics to economic problems and institutions, and for this reason list one or more of the theory or econometrics courses as prerequisites.

Advanced lecture courses Advanced lecture courses, generally numbered ECON 400–449, are limited-enrollment courses that cover relatively advanced material in more depth than regular field courses. Prerequisites usually include two of intermediate microeconomics, intermediate macroeconomics, and econometrics or a mathematics course such as MATH 120. Advanced lecture courses may be applied toward the senior requirement. While these courses vary in approach, they share features of other Economics courses: like field courses, they devote some time to traditional lecturing, and like seminars, they emphasize class interaction, the writing of papers, and the reading of journal articles.

Seminars Although there is diversity in approaches in the various seminars (courses generally numbered ECON 450–489), all have in common an emphasis on class interaction, the writing of papers, and the reading of journal articles. Seminars represent an opportunity for students to apply and extend the economics they have learned through their earlier coursework. Seminars may be applied toward the senior requirement.

Enrollment in seminars and advanced lecture courses is limited. Senior Economics majors who have not yet completed the senior requirement for the major are given priority for these courses and may preregister; see the department website for instructions. Students must take two of three core courses in intermediate microeconomics, intermediate macroeconomics, and econometrics before enrolling in a seminar. Other majors and nonmajors may enroll in Economics seminars and advanced lecture courses as space permits, but they may not preregister.

Distinction in the Major To be considered for Distinction, students must meet the appropriate grade standards as described in this bulletin under Honors and submit a senior essay to the Economics department. Students who fail to submit an essay will not be considered for Distinction. Grade computation for Distinction does not include

the introductory economics courses, the required mathematics course, or courses taken outside Yale. Economics courses taken beyond the requirements of the major are counted toward the Distinction calculation.

Credit/D/Fail Courses taken Credit/D/Fail and residential college seminars may not be counted toward the requirements of the major.

Roadmap See visual roadmap of the requirements.

SENIOR REQUIREMENT

Majors are required to take two departmental courses numbered ECON 400–491, at least one of which must be taken in the senior year. The senior requirement must be met by taking Yale Economics courses.

Senior essay Only those majors who submit a senior essay earning a grade of A or A– are eligible for Distinction in the Major. There are four types of senior essays: (1) students may write a one-term essay in the fall of the senior year as an independent project on a topic of their own design under the close and regular supervision of a faculty adviser (ECON 491); (2) students may write a two-term essay starting in the fall and continued into the spring of the senior year as an independent project on a topic of their own design under the close and regular supervision of a faculty adviser (ECON 491 and ECON 492); (3) students may write a one-term essay in an advanced departmental course (numbered 400–489) taken during the fall term of the senior year; or (4) students may write a two-term essay beginning in an advanced departmental course (numbered 400–489) taken during the fall term, and completed in the spring of the senior year as an independent project under the close and regular supervision of a faculty adviser (ECON 492). Under this final option the instructor of the advanced departmental course taken in the fall term typically serves as the faculty adviser.

Note that the essay must be written during the senior year and that students may submit a senior essay only if they have an approved prospectus and a senior essay adviser. Senior essays that are not submitted on time will receive a grade of Incomplete. Senior essays with grades of Incomplete without permission of the residential college dean are subject to grade penalties when submitted.

Students are advised to complete a second semester of econometrics either before or concurrently with writing the senior essay; at least one of the two econometrics courses should include work in data analysis. Beginning with the class of 2021, students will not be allowed to write a senior essay without completing two semesters of econometrics.

Meetings for seniors to discuss the senior essay guidelines and requirements will be held on Tuesday, August 27, 2019, at 12:15 p.m. and Wednesday, August 28, 2019, at 4:00 p.m. in Rm. 106, 28 Hillhouse Ave. Senior essay prospectus forms are due Monday, September 30, 2019.

ADVISING

The Economics department has faculty representatives/advisers for each residential college, typically fellows of that college. Students majoring in economics should consult with and secure written approval of their course selection from one of their college representatives. Questions concerning the major or programs of study may

also be directed to the college representative. College representatives can be found on the department website.

Transfer credits Students who take a term abroad or take summer courses outside of Yale may petition the DUS to count at most two courses from outside Yale toward the requirements of the major. Students who take a year abroad may petition to count at most three courses. Many economics courses taken outside Yale do not meet the requirements of the Economics major; students should consult with the DUS before taking such courses. Courses taken outside Yale may not be counted toward the major requirements in introductory microeconomics, introductory macroeconomics, intermediate microeconomics, intermediate macroeconomics, or econometrics. See the departmental website section on transferring credits.

Graduate courses Well-qualified students who have acquired the requisite background in undergraduate courses may, with written permission of the instructor, the DUS, and the director of graduate studies, be admitted to graduate courses and seminars. Descriptions of courses are available on the department website.

Students who are planning graduate work in economics should take additional mathematics courses beyond the one-term course required for the major. Many graduate programs in economics require courses in multivariate calculus, linear algebra, and real analysis. Please see the department website on PhD program preparation. Students are urged to discuss their plans for graduate work with the DUS as early in their college careers as possible.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 12 term courses (incl senior req)

Specific courses required ECON 121 or 125; and ECON 122 or 126; and ECON 117 or 131, 123, 132 or 136

Distribution of courses 3 introductory classes (or equivalents with DUS permission); 2 core courses (intermediate micro and intermediate macro); 1 math course; 4 electives

Substitution permitted 1 related course in another dept, with DUS approval

Senior requirement 2 courses numbered ECON 400–491, at least 1 in senior year, as indicated

FACULTY OF THE DEPARTMENT OF ECONOMICS

Professors Joseph Altonji, Donald Andrews, Costas Arkolakis, Orazio Attanasio, Dirk Bergemann, Steven Berry, Truman Bewley, Xiaohong Chen, Ray Fair, John Geanakoplos, Pinelopi Goldberg, Timothy Guinnane, Philip Haile, Marina Halac, Johannes Horner, Gerald Jaynes, Yuichi Kitamura, Alvin Klevorick, Samuel Kortum, Naomi Lamoaux, Giovanni Maggi, Konstantinos Meghir, Giuseppe Moscarini, Kaivan Munshi, William Nordhaus, Gerard Padró i Miquel, Rohini Pande, Peter Phillips, Benjamin Polak, Mark Rosenzweig, Larry Samuelson, Anna Sanktjohanser, Katja Seim, Robert Shiller, Anthony Smith, Aleh Tsyvinski, Edward Vytlačil, Ebonya Washington, Fabrizio Zilibotti

Associate Professors Timothy Armstrong, Mitsuru Igami, Philipp Strack

Assistant Professors Eduardo Dávila, Jose-Antonio Espin-Sanchez, Mira Frick, John Eric Humphries, Zhen Huo, Ryota Iijima, Ilse Lindenlaub, Yusuke Narita, Cormac O'Dea, Michael Peters, Nicholas Ryan, Anna Sanktjohanser

Senior Lecturers Marnix Amand, Michael Boozer, Evangelia Chalioti, William Hawkins, Tolga Koker, Guillermo Noguera, Soenje Reiche, María Saez Martí

Lecturer Katerina Simons

Introductory Courses

* **ECON 108a or b, Quantitative Foundations of Microeconomics** Tolga Koker
Introductory microeconomics with a special emphasis on quantitative methods and examples. Intended for students with limited or no experience with calculus. Enrollment limited. Online preregistration is required; visit economics.yale.edu/undergraduate-program for more information. May not be taken after ECON 110 or 115. QR, SO

* **ECON 110a or b, An Introduction to Microeconomic Analysis** Staff
Similar to ECON 115, but taught as a lecture discussion with limited enrollment. Enrollment limited to first-years and sophomores. Online preregistration is required; visit economics.yale.edu/undergraduate-program for more information. May not be taken after ECON 108 or 115. QR, SO

* **ECON 111a or b, An Introduction to Macroeconomic Analysis** Staff
Similar to ECON 116, but taught as a lecture discussion with limited enrollment. Enrollment limited to first-years and sophomores. Online preregistration is required; visit economics.yale.edu/undergraduate-program for more information. May not be taken after ECON 116. Prerequisite: ECON 108, 110, or 115. SO

ECON 115a or b, Introductory Microeconomics Staff
An introduction to the basic tools of microeconomics to provide a rigorous framework for understanding how individuals, firms, markets, and governments allocate scarce resources. The design and evaluation of public policy. May not be taken after ECON 108 or 110. QR, SO

ECON 116a or b, Introductory Macroeconomics Staff
An introduction that stresses how the macroeconomy works, including the determination of output, unemployment, inflation, interest rates, and exchange rates. Economic theory is applied to current events. May not be taken after ECON 111. Prerequisite: ECON 108, 110, or 115. SO

ECON 117a or b, Introduction to Data Analysis and Econometrics Staff
Introduction to data analysis from the beginning of the econometrics sequence; exposure to modern empirical economics; and development of credible economic analysis. This course emphasizes working directly and early with data, through such economic examples as studies of environmental/natural resource economics, intergenerational mobility, discrimination, and finance. Topics include: probability, statistics, and sampling; selection, causation and causal inference; regression and model specification; and machine learning and big data. Prerequisites: ECON 108, 110, 115, or equivalent and familiarity with single variable calculus. Students who have taken ECON 131 may not receive major credit for this course. QR, SO

Intermediate Courses

ECON 121a or b, Intermediate Microeconomics Staff

The theory of resource allocation and its applications. Topics include the theory of choice, consumer and firm behavior, production, price determination in different market structures, welfare, and market failure. After introductory microeconomics and completion of the mathematics requirement for the major or its equivalent. Elementary techniques from multivariate calculus are introduced and applied, but prior knowledge is not assumed. May not be taken after ECON 125. QR, SO

ECON 122a or b, Intermediate Macroeconomics Staff

Contemporary theories of employment, finance, money, business fluctuations, and economic growth. Their implications for monetary and fiscal policy. Emphasis on empirical studies, financial and monetary crises, and recent policies and problems. Enrollment limited in the fall term. After two terms of introductory economics and completion of the mathematics requirement for the major or its equivalent. May not be taken after ECON 126. QR, SO

ECON 125a, Microeconomic Theory Ryota Iijima

Similar to ECON 121 but with a more intensive treatment of consumer and producer theory, and covering additional topics including choice under uncertainty, game theory, contracting under hidden actions or hidden information, externalities and public goods, and general equilibrium theory. Recommended for students considering graduate study in economics. After introductory economics, and MATH 118 or 120 or equivalent. May not be taken after ECON 121. QR, SO

* **ECON 126b, Macroeconomic Theory** Anthony Smith

Similar to ECON 122 but with a more intensive treatment of the mathematical foundations of macroeconomic modeling, and with rigorous study of additional topics. Recommended for students considering graduate study in economics. After two terms of introductory economics, and MATH 118 or 120 or equivalent. May not be taken after ECON 122. QR, SO

Data Analysis and Econometrics

ECON 123a or b, Intermediate Data Analysis and Econometrics Staff

Comprehensive and theoretical examination of econometrics, with further exploration of topics covered in ECON 117. A term research project addresses a research question chosen by the student, and involves the application of learned methods to a relevant data set. Prerequisites: ECON 108, 110, 115, or equivalent; ECON 117; and familiarity with single variable calculus. QR, SO

ECON 135a, Introduction to Probability and Statistics Timothy Armstrong

Foundations of mathematical statistics: probability theory, distribution theory, parameter estimation, hypothesis testing, regression, and computer programming. Recommended for students considering graduate study in economics. Prerequisites: Introductory microeconomics and MATH 118 or MATH 120 and MATH 222; or MATH 120 and MATH 225. QR, SO

ECON 136b, Econometrics Yuichi Kitamura

Continuation of ECON 135 with a focus on econometric theory and practice: problems that arise from the specification, estimation, and interpretation of models of economic

behavior. Topics include classical regression and simultaneous equations models; panel data; and limited dependent variables. Recommended for students considering graduate study in economics. Prerequisites: After ECON 135 or STAT 241 and 242. May not be taken concurrently with STAT 242. QR, SO

Field Courses

ECON 159b, Game Theory Marina Halac

An introduction to game theory and strategic thinking. Ideas such as dominance, backward induction, Nash equilibrium, evolutionary stability, commitment, credibility, asymmetric information, adverse selection, and signaling are applied to games played in class and to examples drawn from economics, politics, the movies, and elsewhere. After introductory microeconomics. No prior knowledge of game theory assumed. QR, SO

ECON 170a, Health Economics and Public Policy Howard Forman

Application of economic principles to the study of the U.S. health care system. Emphasis on basic principles about the structure of the U.S. system, current problems, proposed solutions, and the context of health policy making and politics. After introductory microeconomics. SO

ECON 171b / AFAM 146b / EDST 271b, Urban Inequalities and Educational Inequality Gerald Jaynes

Analysis of contemporary policy problems related to academic under performance in lower income urban schools and the concomitant achievement gaps among various racial and ethnic groups in United States K-12 education. Historical review of opportunity inequalities and policy solutions proposed to ameliorate differences in achievement and job readiness. Students benefit from practical experience and interdisciplinary methods, including a lab component with time spent in a New Haven high school. Prerequisites: Any course offered by Education Studies, or one course in history or any social science, either: Anthropology, Economics, Political Science, Psychology, Sociology. EDST 110 is preferred, although not required. SO

ECON 182b / HIST 135b, American Economic History Naomi Lamoreaux

The growth of the American economy since 1790, both as a unique historical record and as an illustration of factors in the process of economic development. The American experience viewed in the context of its European background and patterns of industrialization overseas. After introductory microeconomics. WR, SO

ECON 184b / GLBL 234b, International Economics Peter Schott

Introduction to conceptual tools useful for understanding the strategic choices made by countries, firms, and unions in a globalized world. After two terms of introductory economics. SO

ECON 186a, European Economic History, 1700–1815 Timothy Guinnane

European economic growth and development from the late seventeenth century through the first stages of the British industrial revolution. The role of institutional development, trade and imperialism, agricultural improvements, and industrialization. Particular attention to comparisons between Britain and other parts of Europe. After ECON 115 or 121, and ECON 116 or 122. SO

ECON 251a, Financial Theory John Geanakoplos

Study of the financial system as part of the global economy, rather than only the financial world. Topics include bond pricing, the capital asset pricing model, option

pricing, the social security system, the mortgage market, hedge funds, collateral, default, and financial crises. Prerequisite: After introductory microeconomics. QR, SO

ECON 252b, Financial Markets Robert Shiller

An overview of the ideas, methods, and institutions that permit human society to manage risks and foster enterprise. Description of practices today and analysis of prospects for the future. Introduction to risk management and behavioral finance principles to understand the functioning of securities, insurance, and banking industries. After two terms of introductory economics. SO

ECON 301b, International Trade: Data and Analysis Guillermo Noguera

The goal of this course is to provide students with rigorous theoretical and empirical tools to analyze questions of current interest in international trade. The emphasis is on applying economic concepts to international trade data, using both computable economic models and empirical regression methods. This course is primarily intended for junior and senior economics majors. Students benefit from having a background in MATH 118 or MATH 120, statistics/econometrics, and intermediate microeconomics. If you do not satisfy these requisites, instructor's approval is necessary. SO

ECON 325b / EP&E 321b / SAST 281b, Economics of Developing Countries: Focus on South Asia Zachary Barnett-Howell

Analysis of current problems of developing countries. Emphasis on the role of economic theory in informing public policies to achieve improvements in poverty and inequality, and on empirical analysis to understand markets and responses to poverty. Topics include microfinance, education, health, agriculture, intrahousehold allocations, gender, and corruption. Prerequisites: introductory microeconomics and introductory econometrics. SO

*** ECON 331a, The Economics of Energy and Climate Change** William Nordhaus

The essentials of energy and environmental economics, with applications. Analysis of core topics in public goods, intertemporal choice, uncertainty, decision theory, and exhaustible resources. Applications include energy security, nuclear power, the relationship between nuclear power and nuclear proliferation, and climate change. Enrollment limited. Prerequisite: two terms of introductory economics. SO

ECON 335a, Growth and Macroeconomics Fabrizio Zilibotti

The course provides a rigorous framework for understanding the process of economic growth. The main focus of the course is on the factors sustaining long-run growth. We emphasize the role of governments and institutional factors. The final part of the course explores the demand side of the economy and short-run equilibrium phenomena such as monetary policy, financial factors, stabilization policy, and financial crises. Introductory Macroeconomics, Intermediate Macroeconomics SO

ECON 338a / EAST 338a / GLBL 318a, The Next China Stephen Roach

Economic development in China since the late 1970s. Emphasis on factors pushing China toward a transition from its modern export- and investment-led development model to a pro-consumption model. The possibility of a resulting identity crisis, underscored by China's need to embrace political reform and by the West's long-standing misperceptions of China. Prerequisite: introductory macroeconomics. SO

ECON 339b, Advance Competition Economics and Policy Fiona Scott Morton

Limits that antitrust laws, as applied and interpreted by agencies, courts, and competitors, place on firm behavior. Economic theories underlying antitrust

enforcement. Whether legal rules restricting competitive behavior increase social welfare and how they affect managerial choices. The evidence and reasoning advanced in key antitrust cases; how outcomes may affect social welfare and firm strategies. Goals and procedures of US and EU antitrust agencies. SO

ECON 350a, Mathematical Economics: General Equilibrium Theory Eduardo Davila
An introduction to general equilibrium theory and its extension to equilibria involving uncertainty and time. Discussion of the economic role of insurance and of intertemporal models, namely, the overlapping generations model and the optimal growth theory model. Recommended for students considering graduate study in economics. After MATH 118 or 120, and intermediate microeconomics. QR, SO

ECON 351b, Mathematical Economics: Game Theory Philipp Strack
Introduction to game theory and choice under uncertainty. Analysis of the role of information and uncertainty for individual choice behavior, as well as application to the decision theory under uncertainty. Analysis of strategic interaction among economic agents, leading to the theory of auctions and mechanism design. Recommended for students considering graduate study in economics. After MATH 118, 120, and intermediate microeconomics. QR, SO

ECON 361a, Corporate Finance Heather Tookes
Financial management from inside the corporation or operating entity. Topics include capital budgeting and valuation, optimal capital structure, initial public offerings, mergers, and corporate restructuring. Cases and problem sets provide applications. Prerequisites: intermediate microeconomics and econometrics.

* **ECON 363a, Global Financial Crisis** Andrew Metrick and Timothy Geithner
Comprehensive survey of the causes, events, policy responses, and aftermath of the recent global financial crisis. Study of the dynamics of financial crises in a modern economy. Prerequisite: Successful completion of a course in introductory economics. SO

ECON 365b / CPSC 365b, Algorithms James Glenn
Paradigms for algorithmic problem solving: greedy algorithms, divide and conquer, dynamic programming, and network flow. NP completeness and approximation algorithms for NP-complete problems. Algorithms for problems from economics, scheduling, network design and navigation, geometry, biology, and optimization. Provides algorithmic background essential to further study of computer science. Either CPSC 365 or CPSC 366 may be taken for credit. Prerequisites: CPSC 202 and 223. QR

* **ECON 366b / CPSC 366b, Intensive Algorithms** Yang Cai
Mathematically sophisticated treatment of the design and analysis of algorithms and the theory of NP completeness. Algorithmic paradigms including greedy algorithms, divide and conquer, dynamic programming, network flow, approximation algorithms, and randomized algorithms. Problems drawn from the social sciences, Data Science, Computer Science, and engineering. For students with a flair for proofs and problem solving. Either CPSC 365 or CPSC 366 may be taken for credit. Prerequisites: MATH 244 and CPSC 223. QR

Advanced Lecture Courses

Senior Economics majors may preregister for advanced lecture courses; see the departmental website for instructions. Other interested students may enroll with permission of the instructor during the course selection period.

*** ECON 407a / GBLB 310a, International Finance** Ana Fieler

A study of how consumers and firms are affected by the globalization of the world economy. Topics include trade costs, the current account, exchange rate pass-through, international macroeconomic co-movement, multinational production, and gains from globalization. Prerequisite: intermediate macroeconomics or equivalent. SO

*** ECON 413a / AMTH 437a / EENG 437a / S&DS 430a, Optimization Techniques**
Sekhar Tatikonda

Fundamental theory and algorithms of optimization, emphasizing convex optimization. The geometry of convex sets, basic convex analysis, the principle of optimality, duality. Numerical algorithms: steepest descent, Newton's method, interior point methods, dynamic programming, unimodal search. Applications from engineering and the sciences. Prerequisites: MATH 120 and 222, or equivalents. May not be taken after AMTH 237. QR

ECON 419a, Financial Time Series Econometrics Xiaohong Chen

Survey of methods used to analyze financial time series data. Classic linear models; autocorrelation in error variances; methods that allow for nonlinearities; methods tailored to analysis of high-frequency data and modeling of value at risk; vector autoregressive models; factor models; the Kalman filter. Prerequisites: ECON 117 and 123, ECON 131 and 132, or ECON 135 and 136. SO

ECON 420a, Applied Microeconometrics Yuichi Kitamura and Timothy Armstrong

Advanced study of econometric theory and applied econometrics, providing students opportunity and ability to conduct high-level empirical research, combining economics, econometrics, and data. Recommended for students planning to write or currently writing an empirical senior essay. Econ121 (Intermediate Micro), and either Econ 132 (Econometrics and Data Analysis II) or Econ 136 (Econometrics). SO

ECON 438a, Applied Econometrics: Politics, Sports, Microeconomics Ray Fair

This course has an applied econometrics focus. Topics include voting behavior, betting markets, and various issues in sports. The aim of the course is to help students prepare original empirical research using econometric tools and to read empirical papers in economics and other social sciences. Students write three empirical papers. The first can be an extension of an existing article, where some of the results are duplicated and then extended. The second is similar to the first with no example provided. The third is an original paper within the range of topics covered in the course, where data are collected and analyzed using relevant econometric techniques. Prerequisite: One or two econometrics courses. SO

Seminars

Senior Economics majors may preregister for departmental seminars; see the departmental website for instructions. Other interested students may enroll with permission of the instructor during the course selection period.

* **ECON 450a, Investment Analysis** David Swensen and Dean Takahashi

Examination of investment management in theory and practice. Discussion of asset allocation, investment strategy, and manager selection from the perspective of an institutional investor. Focus on the degree of market efficiency and opportunity for generating attractive returns. SO

* **ECON 454a / EP&E 254a / GLBL 331a, Evolution of Central Banking** Rakesh Mohan

Changes in the contours of policy making by central banks since the turn of the twentieth century. Theoretical and policy perspectives as well as empirical debates in central banking. The recurrence of financial crises in market economies. Monetary policies that led to economic stability in the period prior to the collapse of 2007–2008. Changes in Monetary Policies since the Great Financial Crisis. Prerequisite: ECON 122. SO

* **ECON 456a, Private Equity Investing** Michael Schmertzler

A case-oriented study of principal issues and investment types found in substantial private equity portfolios. Discussion of enterprise valuation, value creation, business economics, negotiation, and legal structure, based on primary source materials and original cases. Prerequisite: Econometrics, or ECON 255, or permission of instructor. SO

* **ECON 460a, Financial Economics, Information, Predictions** Staff

Financial economics with special focus on the role of information and the use of markets as forecasting devices. Topics include choice under uncertainty, asset valuation in multi-period models, arbitrage theory, market microstructure, information aggregation, probability elicitation, prediction markets. Prerequisites: ECON 121, a course covering basic probability theory such as ECON 131 or ECON 135, and completion of all MATH requirements of the economics major. SO

* **ECON 470b / EP&E 232b / GLBL 233b, Strategies for Economic Development** Rakesh Mohan

How strategies for economic development have changed over time and how dominant strands in development theory and practice have evolved. Students trace the influence of the evolution in thinking on actual changes that have taken place in successful development strategies, as practiced in fast growing developing countries, and as illustrated in case studies of fast growth periods in Japan, South Korea, Brazil, China, and India. Prerequisites: introductory microeconomics and macroeconomics.

* **ECON 474b / EAST 454b / GLBL 312b, Economic and Policy Lessons from Japan** Stephen Roach

An evaluation of modern Japan's protracted economic problems and of their potential implications for other economies, including the United States, Europe, and China. Policy blunders, structural growth impediments, bubbles, the global economic crisis of 2008, and Abenomics; risks of secular stagnation and related dangers to the global economy from subpar post-crisis recoveries. Focus on policy remedies to avert similar problems in other countries. Prerequisite: an introductory course in macroeconomics. SO

* **ECON 475a / EP&E 286a, Discrimination in Law, Theory, and Practice** Gerald Jaynes

How law and economic theory define and conceptualize economic discrimination; whether economic models adequately describe behaviors of discriminators as documented in court cases and government hearings; the extent to which economic theory and econometric techniques aid our understanding of actual marketplace discrimination. Prerequisites: introductory microeconomics and at least one additional course in Economics, African American Studies, Ethnicity, Race, and Migration, or Women's, Gender, and Sexuality Studies.

* **ECON 480a / GLBL 311a, Banking Crises and Financial Stability** Sigrídur Benediktsdóttir

Focus on systemic risk, banking crises, financial stability and macroprudential policies. Additional emphasis on systemic risk and prudential policies in peripheral European economies and emerging economies. Prerequisites: ECON 115 and 116, or equivalent.
SO

* **ECON 481a / EP&E 298a, Empirical Microeconomics** Guillermo Noguera

Introduction to empirical microeconomics and its methodologies. Academic research in the field explored using tools from economic theory and econometrics. Topics include approaches to identification, environmental effects on health, and the economics of crime, gender, and race. Prerequisites: intermediate microeconomics and econometrics.
SO

Senior Essay and Directed Reading Courses

* **ECON 491a and ECON 492a, The Senior Essay** Ebonya Washington

Students deciding to write one-term senior essays by enrolling in ECON 491, or two-term senior essays by enrolling in ECON 491 and 492, must choose their topics and advisers by Monday, October 1, 2018. One-term senior essays are due at the end of the last week of classes in the fall term. Two-term senior essays are due by 4:30 p.m. on Wednesday, April 3, 2019. Essays should be submitted electronically to the Economics department (qazi.azam@yale.edu). Failure to turn the essay in on time will result in grade penalties and the loss of consideration for distinction. Advisers are chosen with the assistance of the DUS. The format and character of the departmental senior essay may vary to suit the interest of the student and the demands of the topic, but it is expected that the tools and concepts of economic analysis will be employed and that the essay will contain original research. Paper lengths may vary; the normal expectation is thirty pages. Students may receive up to two credits for the senior essay, though it counts as only one departmental seminar whether one or two terms are taken. Meetings for seniors to discuss the senior essay guidelines and requirements will be held on Tuesday August 28, 2018 at 12:15 p.m. and Wednesday, August 29, 2018 at 4:00 p.m. in Room 106, 28 Hillhouse Avenue. Senior essay prospectus forms are due Monday, October 1, 2018.

* **ECON 498a, Directed Reading** Ebonya Washington

Junior and senior economics majors desiring a directed reading course in special topics in economics not covered in other graduate or undergraduate courses may elect this course, not more than once, with written permission of the director of undergraduate studies and of the instructor. The instructor meets with the student regularly, typically for an hour a week, and the student writes a paper or a series of short essays. Junior

and senior majors may take this course for a letter grade, but it does not meet the requirement for a department seminar.

Economics and Mathematics

Directors of undergraduate studies: Ebonya Washington (ebonya.washington@yale.edu) (Economics), Rm. 36, 37 Hillhouse Ave., 432-9901; registrar: Qazi Azam (qazi.azam@yale.edu); Yifeng Liu (yifeng.liu@yale.edu) (Mathematics), DL 410; associate director of undergraduate studies: Miki Havlickova (miki.havlickova@yale.edu) (Mathematics), DL 446, 432-4682

The Economics and Mathematics major is intended for students with a strong interest in both mathematics and economics and for students who may pursue a graduate degree in economics.

PREREQUISITES

The major has prerequisites in both mathematics and economics: MATH 120; ECON 110 or 115; and ECON 111 or 116. With permission of the directors of undergraduate studies (DUSes), upper-level courses may be substituted for prerequisite courses. Upper-level courses substituted for prerequisites do not count toward the total of twelve term courses (beyond the introductory level in economics and mathematics) required for the major.

REQUIREMENTS OF THE MAJOR

A total of twelve term courses is required beyond the introductory level in economics and in mathematics: seven term courses in economics and five term courses in mathematics. These courses must include:

1. One intermediate microeconomics course chosen from ECON 121 or 125, and one intermediate macroeconomics course chosen from ECON 122 or 126.
2. A year of mathematical economics, ECON 351 and one of ECON 350, 417, or 433.
3. Two courses in econometrics, ECON 135 and 136 (with permission of the director of undergraduate studies (DUS) in Economics, S&DS 241 and 242 may be taken instead of ECON 135, in which case they count as one economics course and not as mathematics courses).
4. A course in linear algebra, MATH 222 or 225 (or 230 and 231, for two course credits).
5. An introductory course in analysis, MATH 300 or 301.

A course must be listed with a MATH number to count toward the mathematics requirements—substitutions from other departments are not allowed.

Distinction in the Major To be considered for Distinction in the Major, students must meet minimum grade standards, as specified in *The Undergraduate Curriculum*, and submit a senior essay in Economics that earns a grade of A or A-. One-term essays may be written in either an Economics department senior seminar or in ECON 491. Two-term senior essays may be written in either an Economics senior seminar and ECON 492 or in ECON 491 and 492. (The paper must be written in a course or courses taken in the senior year.) For details see Economics. All courses beyond the introductory level in Mathematics and Economics are counted in the computation of grades for Distinction.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

SENIOR REQUIREMENT

Students must take the senior seminar in mathematics, MATH 480. A senior essay in Economics is optional.

ADVISING

Students interested in the major should consult both DUSes, and verify with each that their proposed program meets the relevant guidelines. Registration forms must be signed by both DUSes each term.

REQUIREMENTS OF THE MAJOR

Prerequisites MATH 120; ECON 110 or 115; ECON 111 or 116

Number of courses 12 term courses beyond prerequisites (incl senior req)

Distribution of courses 7 courses in econ and 5 in math

Specific courses required ECON 121 or 125, ECON 122 or 126, 135, 136, (ECON 350, 417 or 433), ECON 351; MATH 222 or 225 (or 230 and 231), MATH 300 or 301

Substitution permitted S&DS 241 and 242 for ECON 135, with permission of DUS in Econ

Senior requirement Senior sem in math (MATH 480); optional senior essay in economics

Education Studies

Executive director: Mira Debs (mira.debs@yale.edu), Rm 408, 493 College St., 432-4631; yalecollege.yale.edu/content/education-studies

EDUCATION STUDIES MULTIDISCIPLINARY ACADEMIC PROGRAM

Education Studies is a multidisciplinary academic program in Yale College that provides a structure for students interested in educational institutions, policy, teaching, and learning. The program promotes a multidisciplinary understanding of the role of education historically, socially, politically, and economically.

Any Yale College student interested in education studies may take the introductory survey course, EDST 110, Foundations in Education Studies. This lecture course explores the historical, social, philosophical, and theoretical underpinnings of the field and helps students understand the critical role of education in society. The course examines aspects of education research, policy, and practice.

In the fall of the sophomore year, students who have successfully completed or are currently enrolled in EDST 110 may apply to become a Yale Education Studies Scholar alongside their major course of study. The program selects students with appropriate background and interest in education research, policy, and practice, and develops their experience and involvement in issues related to education. Each cohort of students participates in symposia and other events, explores educational topics through collaboration, and establishes an advising relationship with mentors. Education Studies Scholars also gain practical field experience through an appropriate academic-year educational opportunity or summer field experience.

Each Education Studies Scholar develops a course plan that advances the student's interests in an aspect of education studies. To fulfill the requirements of the program, students must complete EDST 110, a field experience, at least two electives, and two courses, EDST 400 and either EDST 410 or 490, as the senior capstone requirement.

REQUIREMENTS OF THE PROGRAM

Prerequisite EDST 110

Number of courses 5 courses (incl prereq and senior req)

Other requirement Field experience as described on the EDST website

Senior requirement 2 courses to include EDST 400 and EDST 410 or EDST 490

Courses

* **EDST 107b / MB&B 107b / PHYS 107b, Being Human in STEM** Rona Ramos

A collaboratively-designed, project-oriented course that seeks to examine, understand, and disseminate how diversity of gender, race, religion, sexuality, economic circumstances, etc. shape the STEM experience at Yale and nationally, and that seeks to formulate and implement solutions to issues that are identified. Study of relevant peer-reviewed literature and popular-press articles. Implementation of a questionnaire and interviews of STEM participants at Yale. Creation of role-play scenarios for provoking discussions and raising awareness. Design and implementation of group interventions.

SO

EDST 110a / SOCY 112a, Foundations in Education Studies Mira Debs

Introduction to key issues and debates in the U.S. public education system. Focus on the nexus of education practice, policy, and research. Social, scientific, economic, and political forces that shape approaches to schooling and education reform. Theoretical and practical perspectives from practitioners, policymakers, and scholars. SO

* **EDST 125a / CHLD 125a / PSYC 125a, Child Development** Nancy Close and Carla Horwitz

The reading of selected material with supervised participant-observer experience in infant programs, a day-care and kindergarten center, or a family day-care program. Regularly scheduled seminar discussions emphasize both theory and practice. An assumption of the course is that it is not possible to understand children – their behavior and development – without understanding their parents and the relationship between child and parents. The focus is on infancy as well as early childhood. Enrollment limited to juniors and seniors. WR, SO

* **EDST 127a or b / CHLD 127a or b / PSYC 127a or b, Theory and Practice of Early Childhood Education** Carla Horwitz

Development of curricula and responsive educational environments for young children – in light of current research and child development theory. The course focuses on critical analysis of programs for young children and the ways in which political context contributes to the practice of education. Regularly scheduled seminar discussions emphasize both theory and practice. Supervised participant-observer experience in an early childhood classroom. Components of the course include behavior and development, planning, assessment and standards, culture, teacher preparation, and working with families. Priority given to seniors, juniors and Ed Studies students. WR, SO RP

* **EDST 128b / CHLD 128b / PSYC 128b, Language, Literacy, and Play** Nancy Close and Carla Horwitz

The complicated role of play in the development of language and literacy skills among preschool-aged children. Topics include social-emotional, cross-cultural, cognitive, and communicative aspects of play. WR, SO RP

EDST 135a / PHIL 130a, Philosophy of Education Jason Stanley

An introduction to the philosophy of education. In this course, we read classical texts about the nature and purpose of education, focusing ultimately on the question of the normative shape and form of education in liberal democracy. What is the difference between education and indoctrination? What is the proper relation, in a liberal democracy, between civic education and vocational education? What shape or form should education take, if it is to achieve its goals? How, for example, is the liberal ideal of equality best realized in the form and structure of an educational system? Authors include Plato, Rousseau, Du Bois, Washington, Stanton, Dewey, Cooper, Woodson, and Freire. HU

EDST 144a / ER&M 211a / EVST 144a / SOCY 144a, Race, Ethnicity, and Immigration Grace Kao

Exploration of sociological studies and theoretical and empirical analyses of race, ethnicity, and immigration, with focus on race relations and racial and ethnic differences in outcomes in contemporary U.S. society (post-1960s). Study of the patterns of educational and labor market outcomes, incarceration, and family formation

of whites, blacks (African Americans), Hispanics, and Asian Americans in the United States, as well as immigration patterns and how they affect race and ethnic relations.

SO

EDST 160b / PSYC 150b, Social Psychology Maria Gendron

Theories, methodology, and applications of social psychology. Core topics include the self, social cognition/social perception, attitudes and persuasion, group processes, conformity, human conflict and aggression, prejudice, prosocial behavior, and emotion.

SO

* **EDST 162a / SOCY 162a, Methods in Quantitative Sociology** Staff

Introduction to methods in quantitative sociological research. Topics include: data description; graphical approaches; elementary probability theory; bivariate and multivariate linear regression; regression diagnostics. Students use Stata for hands-on data analysis. QR, SO

EDST 177b / AFAM 198b / CGSC 277b / EP&E 494b / PHIL 177b, Propaganda, Ideology, and Democracy Jason Stanley

Historical, philosophical, psychological, and linguistic introduction to the issues and challenges that propaganda raises for liberal democracy. How propaganda can work to undermine democracy; ways in which schools and the press are implicated; the use of propaganda by social movements to address democracy's deficiencies; the legitimacy of propaganda in cases of political crisis. HU

EDST 180b / PSYC 180b, Abnormal Psychology Jutta Joormann

The major forms of psychopathology that appear in childhood and adult life. Topics include the symptomatology of mental disorders; their etiology from psychological, biological, and sociocultural perspectives; and issues pertaining to diagnosis and treatment. SO

* **EDST 191b / CHLD 126b, Clinical Child Development and Assessment of Young Children** Nancy Close

Exposure to both conceptual material and clinical observations on the complexity of assessing young children and their families. Prerequisites: CHLD 125 or CHLD 128. SO
½ Course cr

* **EDST 223a / PLSC 223a, Learning Democracy: The Theory and Practice of Civic Education** Amir Fairdosi

This is a seminar on the theory and practice of civic education. We begin by investigating philosophies of civic education, asking such questions as: What is civic education and what is its purpose? What knowledge, skills, and values promote human flourishing and the cultivation of a democratic society? What role can and should schools play in this cultivation? In the next part of the course we focus on civic education in practice, exploring various approaches to teaching civics and the empirical evidence in support of each method's effectiveness. We also discuss variations in access to civic education opportunities across socioeconomic, demographic, and national contexts, and how societies might deal with these disparities. SO

* **EDST 225b, Child Care, Society, and Public Policy** Janna Wagner and Jessica Sager

Exploration of societal decisions about where children under the age of five spend their days. Topics include where young children belong; how to regulate, pay for, and support child care arrangements; consideration of gender, race, and family finances; and the profound impact of these decisions on the well-being of children, families, and

the economy. Assignments draw heavily on student insights and reflections. Preference in enrollment will go to students who have taken EDST 110, with Education Studies Scholars receiving priority. SO

* **EDST 230b, American Education and the Law** William Garfinkel

Interactions between American primary-school education and the American legal system, with a focus on historical and contemporary case law. The relationship between schooling and the state; constitutional, statutory, and regulatory law governing the rights and responsibilities of educators, students, and parents; equal educational opportunity. Recommended preparation: EDST 110. Preference to Education Studies Scholars. SO

EDST 237a / LING 217a / PSYC 317a, Language and Mind Maria Piñango

The structure of linguistic knowledge and how it is used during communication. The principles that guide the acquisition of this system by children learning their first language, by children learning language in unusual circumstances (heritage speakers, sign languages) and adults learning a second language, bilingual speakers. The processing of language in real-time. Psychological traits that impact language learning and language use. SO RP

* **EDST 238a / PLSC 238a, Policy, Politics, and Learning on the Education Beat** Jane Karr

Exploration of the national conversation around education issues, and how to write smartly about them. Classes delve into top stories of the last few years—diversity and desegregation, school choice and culture wars—and their impact on policy. Students learn to develop strong, marketable ideas while crafting features aimed at publication. Journalists on the K-12 beat are frequent guests. WR, SO

EDST 271b / AFAM 146b / ECON 171b, Urban Inequalities and Educational Inequality Gerald Jaynes

Analysis of contemporary policy problems related to academic under performance in lower income urban schools and the concomitant achievement gaps among various racial and ethnic groups in United States K-12 education. Historical review of opportunity inequalities and policy solutions proposed to ameliorate differences in achievement and job readiness. Students benefit from practical experience and interdisciplinary methods, including a lab component with time spent in a New Haven high school. Prerequisites: Any course offered by Education Studies, or one course in history or any social science, either: Anthropology, Economics, Political Science, Psychology, Sociology. EDST 110 is preferred, although not required. SO

* **EDST 290a, Leadership, Change, and Improvement in Education** Richard Lemons

Analysis of the most significant challenges faced by the United States educational system, drawing upon research from a range of academic disciplines to understand how schools and districts operate and why certain educational challenges persist, sometimes over multiple generations of students. Students will study successful educational improvement efforts to better understand the political and organizational strategies necessary to improve student experiences and outcomes at scale, as well as the leadership practices necessary to successfully implement and sustain such strategies. Preference given to Education Studies Scholars or others who have taken EDST 110.

SO

* **EDST 328b / PSYC 328b, Learning in the School-Age Child: Core Mechanisms**

Kristi Lockhart

This course focuses on empirically supported principles of learning that are used with K to 8th grade children (and also adolescents and adults) to enhance learning outcomes. We look at twenty-six (A to Z) core mechanisms used to promote learning. Each mechanism is explored from a theoretical, research-based, and practical perspective. Studies conducted in cognitive and perceptual psychology, social psychology, behavioral psychology as well as cultural psychology have contributed to the knowledge of these mechanisms. We discuss how the mechanisms work, what problems they overcome, and the positive (as well as negative) ways in which they can be implemented.

Prerequisite: PSYC 110 or credit for AP Psychology. SO

* **EDST 350b / CHLD 350b / PSYC 350b, Autism and Related Disorders** Fred

Volkmar and James McPartland

Weekly seminar focusing on autism and related disorders of socialization. A series of lectures on topics in etiology, diagnosis and assessment, treatment and advocacy, and social neuroscience methods; topics cover infancy through adulthood. Supervised experience in the form of placement in a school, residence, or treatment setting for individuals with autism spectrum disorders. Details about admission to the course are explained at the first course meeting. Prerequisite: an introductory psychology course.

SO

* **EDST 377b / PSYC 477b, Psychopathology and the Family** Kristi Lockhart

The influence of the family on development and maintenance of both normal and abnormal behavior. Special emphasis on the role of early childhood experiences. Psychological, biological, and sociocultural factors within the family that contribute to variations in behavior. Relations between family and disorders such as schizophrenia, depression, anorexia nervosa, and criminality. Family therapy approaches and techniques. SO

* **EDST 400a, Advanced Topics in Education Studies** Talya Zemach-Bersin

Preparation for a thesis-equivalent capstone project. Building community among each year's cohort through reading seminal texts in Education Studies, while laying the foundation for spring capstone projects through discussion of education studies methodologies and practical research design. First course in the yearlong sequence, followed by EDST 410. EDST 110 and two Education Studies electives. Enrollment limited to senior Education Studies Scholars.

* **EDST 410b, Senior Colloquium and Project** Talya Zemach-Bersin

Culmination of the Education Studies Undergraduate Scholars program. Students conduct a rigorous project on a topic of their choice in education research, policy, and/or practice. Enrollment limited to senior Education Studies Scholars.

* **EDST 478b / MUSI 452b, Music, Service, and Society** Sebastian Ruth

The role of musicians in public life, both on and off the concert stage. New ways in which institutions of music can participate in the formation of civil society and vibrant communities. The potential influence of music on the lives of people experiencing political or social oppression. HU RP

* **EDST 490a or b, Senior Essay Independent Study** Talya Zemach-Bersin

Independent research under faculty direction, involving research, policy or practice resulting in a final capstone paper. This course is open to Education Studies Scholars

who are completing their capstone, in lieu of taking EDST 400 or EDST 410. To register for this course, students must submit a written plan of study approved by a faculty mentor to the Director of Undergraduate Study no later than the end of registration period in the term in which the course is to be taken. The course meets biweekly (every two weeks), beginning in the first week of the term. Prerequisite: EDST 110.

Electrical Engineering

Director of undergraduate studies: Mark Reed (mark.reed@yale.edu), 523 BCT, 432-4306; seas.yale.edu/departments/electrical-engineering

Electrical Engineering broadly encompasses disciplines such as microelectronics, photonics, computer engineering, signal processing, control systems, and communications. Three electrical engineering degree programs are offered, as well as a joint degree between the electrical engineering and computer science departments.

1. The B.S. in Electrical Engineering, accredited by the Engineering Accreditation Commission of ABET, Inc., is the flagship degree program and is the most challenging program in electrical engineering. This program is appropriate for highly motivated students who are interested in entering the engineering profession, and who wish for a flexible enough program to consider a variety of other career paths.
2. The B.S. in Engineering Sciences (Electrical) provides similar technical exposure and equivalent rigor as the ABET program, while retaining the flexibility for students to take a broader range of courses than those mandated by the ABET curriculum. The B.S. in Engineering Sciences (Electrical) is suitable for careers in technology and is a popular choice for those choosing academic, industrial, or entrepreneurial career paths.
3. The B.A. in Engineering Sciences (Electrical) is suitable for careers outside of technology, including managerial, financial, and entrepreneurial career options.
4. The fourth program is a joint Electrical Engineering and Computer Science B.S. degree, which offers a unique blend of electrical engineering and computer science courses that retains the rigor of both fields. This degree is a popular choice for those interested in information technology careers.

The program's educational objectives prepare students for four potential paths. An academic path qualifies graduates to enter a top-tier graduate program conducting research with broad applications or significant consequences, and eventually to teach at an academic or research institution. Graduates following an industrial path can enter a technical path or a managerial path. An entrepreneurial path allows graduates to bring broad knowledge to a startup company, which can deliver a product or service that meets societal needs. Graduates who elect a nontraditional engineering path might complete a professional program in business, law, or medicine, for which their engineering knowledge will be valuable.

See Electrical Engineering and Computer Science for the requirements of the joint B.S. degree.

PREREQUISITES

All three engineering degree programs require MATH 112 and MATH 115 if applicable, ENAS 151 or MATH 120 or higher, ENAS 130 (CPSC 100 and 112 do not fulfill this requirement), and PHYS 180, 181 or higher (PHYS 170, 171 is acceptable for the B.A. degree). Acceleration credits awarded on entrance can be used to satisfy the MATH 112 and 115 requirements. Students whose preparation exceeds the level of ENAS 151 or MATH 120 are asked to take a higher-level mathematics course instead, such as MATH 250. Similarly, students whose preparation at entrance exceeds the

level of PHYS 180, 181 are asked to take higher-level physics courses instead, such as PHYS 200, 201. Students whose programming skills exceed the level of ENAS 130 are asked to take a more advanced programming course instead, such as CPSC 201; consult with the director of undergraduate studies (DUS).

REQUIREMENTS OF THE MAJOR

Because the introductory courses are common to all three degree programs, students do not usually need to make a final choice before the junior year. Each student's program must be approved by the DUS.

B.S. degree program in Electrical Engineering The ABET-accredited B.S. in Electrical Engineering requires, beyond the prerequisites, four term courses in mathematics and science and thirteen term courses covering topics in engineering. These courses include:

1. Mathematics and basic science (four term courses): ENAS 194; MATH 222 or 225; APHY 322 or equivalent; S&DS 238, or S&DS 241, or equivalent.
2. Electrical engineering and related subjects (thirteen term courses): EENG 200, 201, 202, 203, 310, 320, 325, 348, and 481 (the ABET design project senior requirement); and four engineering electives, at least three of which should be at the 400 level. CPSC 365 or CPSC 366, MENG 390, MENG 403, BENG 411, PHYS 430, APHY 458, and all 400-level Computer Science courses qualify as ABET electives. The senior independent research project EENG 471 and/or EENG 472 also qualify (as a single 400-level elective).

The introductory engineering courses are designed such that they may be taken concurrently in the sophomore year; for example, in the fall term students may take EENG 200 and EENG 202, followed by EENG 201 and EENG 203 in the spring term. These courses may be taken in any order, with the exception of EENG 203, which requires EENG 200 as a prerequisite. In this case, it would be helpful to take ENAS 194 and/or ENAS 130 in the first year.

A sample ABET-accredited B.S. degree schedule for students who have taken the equivalent of one year of calculus in high school (and thus are not required to take MATH 112 and MATH 115) could include:

First Year: EENG 200, EENG 201, ENAS 151, PHYS 180, and PHYS 181
 Sophomore: EENG 202, EENG 203, ENAS 130, ENAS 194, and MATH 222
 Junior: EENG 310, EENG 320, EENG 325, EENG 348, S&DS 238, and 1 elective
 Senior: APHY 322, EENG 481, and 3 electives

A sample schedule for students that enter into the ABET-accredited B.S. major at the sophomore year could include:

First Year: ENAS 151, ENAS 130, ENAS 194, PHYS 180, and PHYS 181
 Sophomore: EENG 200, EENG 201, EENG 202, EENG 203, and MATH 222
 Junior: EENG 310, EENG 320, EENG 325, EENG 348, S&DS 238, and 1 elective
 Senior: APHY 322, EENG 481, and 3 electives

A sample schedule for students who enter into the ABET-accredited B.S. major in the first year (and are required to take MATH 112 and MATH 115) and only seek to fulfill basic distribution requirements with no engineering courses, could be:

First Year: MATH 112, MATH 115, PHYS 180, PHYS 181, and ENAS 130

Sophomore: ENAS 151, EENG 200, EENG 201, EENG 202, EENG 203, and MATH 222

Junior: ENAS 194, EENG 310, EENG 320, EENG 325, EENG 348, and S&DS 238

Senior: APHY 322, EENG 481, and 4 electives

B.S. degree program in Engineering Sciences (Electrical) This program requires fewer technical courses and allows more freedom for work in technical areas outside the traditional electrical engineering disciplines (e.g., biomedical engineering, mechanical engineering, physics, etc.). It requires thirteen technical term courses beyond the prerequisites, specifically: MATH 222 or 225; ENAS 194; EENG 200, 201, 202, 203; EENG 471 or 472 (the senior requirement), or with permission of the instructor and the DUS, 481; and six electives approved by the DUS, at least three of which must be at the 400 level. All electives listed for the ABET-accredited B.S. major qualify as electives for this degree.

For students who have taken the equivalent of one year of calculus in high school (and thus are not required to take MATH 112 and MATH 115), a sample schedule for the B.S. degree in Engineering Science (Electrical) could be:

First Year: EENG 200, EENG 201, ENAS 151, PHYS 180, and PHYS 181

Sophomore: EENG 202, EENG 203, ENAS 130, ENAS 194, and MATH 222

Junior: 3 electives

Senior: EENG 471 and/or EENG 472, and 3 electives

The B.S. degree in Engineering Sciences (Electrical) requires fewer specific courses and 4 fewer courses overall than the ABET-accredited degree. Any of the courses required for the ABET-accredited major qualify as electives for this degree, as well as other courses with substantial electrical engineering context, subject to the approval of the DUS. For students entering the major during the sophomore year, or those that need introductory calculus in their first year, sample schedules are similar to those described for the ABET-accredited degree program, with the differences in the B.S. Engineering Sciences (Electrical) degree applied.

The flexibility during the junior and senior years in the schedule above is often used to accommodate a second major, such as Economics, Applied Physics, Computer Science, Physics, or Mechanical Engineering.

B.A. degree program in Engineering Sciences (Electrical) This program is appropriate for those planning a career in fields such as business, law, or medicine where scientific and technical knowledge is likely to be useful. It requires eight technical term courses beyond the prerequisites, specifically: MATH 222, 225, or ENAS 194; EENG 200, 201, 202, and 471 and/or 472 (the senior requirement); and three approved electives.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

SENIOR REQUIREMENT

A research or design project carried out in the senior year is required in all three programs and must be approved by the DUS. Students take EENG 471, 472, or 481, present a written report, and make an oral presentation. Arrangements to undertake a project in fulfillment of the senior requirement must be made by the end of shopping

period in the term in which the student will enroll in the course; by this date, a prospectus approved by the intended faculty adviser must be submitted to the DUS.

ADVISING AND APPROVAL OF PROGRAMS

All Electrical Engineering and Engineering Sciences majors must have their programs approved by the DUS. Arrangements to take EENG 471, 472, or 481 are strongly suggested to be made during the term preceding enrollment in the course. Independent research courses taken before the senior year are graded on a Pass/Fail basis but may be counted toward the requirements of the major.

REQUIREMENTS OF THE MAJOR

ELECTRICAL ENGINEERING, B.S.

Prerequisites MATH 112, 115 if needed; ENAS 151 or MATH 120 or higher; ENAS 130; PHYS 180, 181 or higher

Number of courses 17 term courses beyond prereqs, incl senior req

Specific courses required ENAS 194; MATH 222 or 225; APHY 322; S&DS 238 or S&DS 241; EENG 200, 201, 202, 203, 310, 320, 325, 348

Distribution of courses 4 engineering electives, 3 at 400 level

Senior requirement One-term design project (EENG 481)

ENGINEERING SCIENCES (ELECTRICAL), B.S. AND B.A.

Prerequisites *Both degrees* – MATH 112, 115; ENAS 151 or MATH 120 or higher; ENAS 130; *B.S.* – PHYS 180, 181 or higher; *B.A.* – PHYS 170, 171 or higher

Number of courses *B.S.* – 13 term courses beyond prereqs, incl senior req; *B.A.* – 8 term courses beyond prereqs, incl senior req

Specific courses required *B.S.* – ENAS 194; MATH 222 or 225; EENG 200, 201, 202, 203; *B.A.* – 1 from ENAS 194, MATH 222, or 225; EENG 200, 201, 202

Distribution of courses *B.S.* – 6 electives approved by DUS, 3 at 400 level; *B.A.* – 3 electives approved by DUS

Senior requirement *B.S.* – one-term research or design project (EENG 471 or 472 or, with permission of DUS, 481); *B.A.* – one-term research or design project (EENG 471 and/or 472)

FACULTY OF THE DEPARTMENT OF ELECTRICAL ENGINEERING

Professors James Duncan, Jung Han, Roman Kuc, Tso-Ping Ma, Rajit Manohar, A. Stephen Morse, Kumpati Narendra, Daniel Prober, Mark Reed, Peter Schultheiss (*Emeritus*), Lawrence Staib, Hemant Tagare, Hongxing Tang, Leandros Tassioulas, J. Rimas Vaišnys, Y. Richard Yang

Associate Professors Richard Lethin (*Adjunct*), Sekhar Tatikonda, Fengnian Xia

Assistant Professors Wenjun Hu, Amin Karbasi, Jakub Szefer

Courses

EENG 200a, Introduction to Electronics Mark Reed

Introduction to the basic principles of analog and digital electronics. Analysis, design, and synthesis of electronic circuits and systems. Topics include current and voltage laws that govern electronic circuit behavior, node and loop methods for solving circuit problems, DC and AC circuit elements, frequency response, nonlinear circuits,

semiconductor devices, and small-signal amplifiers. A lab session approximately every other week. After or concurrently with MATH 115 or equivalent. QR, SC

EENG 201b, Introduction to Computer Engineering Jakub Szefer

Introduction to the theoretical principles underlying the design and programming of simple processors that can perform algorithmic computational tasks. Topics include data representation in digital form, combinational logic design and Boolean algebra, sequential logic design and finite state machines, and basic computer architecture principles. Hands-on laboratory involving the active design, construction, and programming of a simple processor. QR

EENG 202a, Communications, Computation, and Control Wenjun Hu

Introduction to systems that sense, process, control, and communicate. Topics include communication systems (compression, channel coding); network systems (network architecture and routing, wireless networks, network security); estimation and learning (classification, regression); and signals and systems (linear systems, Fourier techniques, bandlimited sampling, modulation). MATLAB programming and laboratory experiments illustrate concepts. Prerequisite: MATH 115. QR

EENG 203b, Circuits and Systems Design Hong Tang

Introduction to design in a laboratory setting. A wide variety of practical systems are designed and implemented to exemplify the basic principles of systems theory. Systems include audio filters and equalizers, electrical and electromechanical feedback systems, radio transmitters and receivers, and circuits for sampling and reconstructing music. Prerequisites: EENG 200 and 202. QR, SC RP

* **EENG 235a and EENG 236b, Special Projects** Mark Reed

Faculty-supervised individual or small-group projects with emphasis on laboratory experience, engineering design, or tutorial study. Students are expected to consult the director of undergraduate studies and appropriate faculty members about ideas and suggestions for suitable topics during the term preceding enrollment. These courses may be taken at any time during the student's career. Enrollment requires permission of both the instructor and the director of undergraduate studies, and submission to the latter of a one- to two-page prospectus signed by the instructor. The prospectus is due in the departmental office one day prior to the date that the student's course schedule is due. $\frac{1}{2}$ Course cr per term

EENG 245b / CPSC 235b, Self-Driving Cars: Theory and Practice Man-Ki Yoon

This course explores the theory and practice of building self-driving cars using advanced computing technologies. Topics include embedded system programming, sensor fusion, control theory, and introductory planning and navigation techniques using machine learning and computer vision. Students work in small teams to design and build miniaturized self-driving cars that autonomously navigate an indoor track that resembles real road environments. The final project involves driving competitions and project report/presentation of their work. Prerequisite: CPSC 112, 201, 223, or equivalent. Instructor's permission is required to waive the prerequisites. Enrollment limited to 18. QR

EENG 310b, Signals and Systems Kumpati Narendra

Concepts for the analysis of continuous and discrete-time signals including time series. Techniques for modeling continuous and discrete-time linear dynamical systems including linear recursions, difference equations, and shift sequences. Topics include

continuous and discrete Fourier analysis, Laplace and Z transforms, convolution, sampling, data smoothing, and filtering. Prerequisite: MATH 115. Recommended preparation: EENG 202. QR

EENG 320a, Introduction to Semiconductor Devices Mark Reed

An introduction to the physics of semiconductors and semiconductor devices. Topics include crystal structure; energy bands in solids; charge carriers with their statistics and dynamics; junctions, p-n diodes, and LEDs; bipolar and field-effect transistors; and device fabrication. Additional lab one afternoon per week. Prepares for EENG 325 and 401. Recommended preparation: EENG 200. PHYS 180 and 181 or permission of instructor QR, SC

EENG 325a, Electronic Circuits Fengnian Xia

Models for active devices; single-ended and differential amplifiers; current sources and active loads; operational amplifiers; feedback; design of analog circuits for particular functions and specifications, in actual applications wherever possible, using design-oriented methods. Includes a team-oriented design project for real-world applications, such as a high-power stereo amplifier design. Electronics Workbench is used as a tool in computer-aided design. Additional lab one afternoon per week. Prerequisite: EENG 200. QR RP

EENG 348b / CPSC 338b, Digital Systems Staff

Development of engineering skills through the design and analysis of digital logic components and circuits. Introduction to gate-level circuit design, beginning with single gates and building up to complex systems. Hands-on experience with circuit design using computer-aided design tools and microcontroller programming. Recommended preparation: EENG 201. QR

EENG 397a / ENAS 397a, Mathematical Methods in Engineering J. Rimas Vaišnys

Exploration of several areas of mathematics useful in science and engineering; recent approaches to problem solving made possible by developments in computer software. Mathematica and Eureka are used to investigate and solve problems involving nonlinear differential equations, complex functions, and partial differential equations. Prerequisites: MATH 222, and ENAS 194 or MATH 246, or equivalents; familiarity with computer programming. QR

EENG 406b, Photovoltaic Energy Fengnian Xia

Survey of photovoltaic energy devices, systems, and applications, including review of optical and electrical properties of semiconductors. Topics include solar radiation, solar cell design, performance analysis, solar cell materials, device processing, photovoltaic systems, and economic analysis. Prerequisite: EENG 320 or permission of instructor. QR, SC

EENG 408b, Electronic Materials: Fundamentals and Applications Jung Han

Survey and review of fundamental issues associated with modern microelectronic and optoelectronic materials. Topics include band theory, electronic transport, surface kinetics, diffusion, materials defects, elasticity in thin films, epitaxy, and Si integrated circuits. Prerequisite: EENG 320 or permission of instructor. QR, SC

EENG 426a / ENAS 876a, Silicon Compilation Rajit Manohar

An upper-level course on compiling computations into digital circuits using asynchronous design techniques. Emphasis is placed on the synthesis of circuits that are robust to uncertainties in gate and wire delays by the process of program

transformations. Topics include circuits as concurrent programs, delay-insensitive design techniques, synthesis of circuits from programs, timing analysis and performance optimization, pipelining, and case studies of complex asynchronous designs. Prerequisite: EENG 201 and introductory programming, or permission of instructor.

EENG 428a, Cloud FPGA Jakub Szefer

This course is an intermediate to advanced level course focusing on digital design and use of Field Programmable Gate Arrays (FPGAs). In addition, it centers around the new computing paradigm of Cloud FPGAs, where the FPGAs are hosted remotely by cloud providers and accessed remotely by users. The theoretical aspects of the course focus on digital system modeling and design using the Verilog Hardware Description Language (Verilog HDL). In the course, students learn about logic synthesis, behavioral modeling, module hierarchies, combinatorial and sequential primitives, and implementing and testing the designs in simulation and real FPGAs. Students also learn about FPGA tools from two major vendors: for Xilinx FPGAs and Intel FPGAs (formerly Altera). The practical aspects focus on designing systems using commercial Cloud FPGA infrastructures: Amazon F1 service (Xilinx FPGAs) or through the Texas Advanced Computing Center (Intel FPGAs). Students learn about cloud computing, interfacing servers to FPGAs, PCIe and AXI protocols, and how to write software that runs on the cloud servers and leverages the FPGAs for acceleration of various computations. Prerequisites: EENG 201 and 348 or permission of the instructor. Students should be familiar with digital design basics and have some experience with Hardware Description Languages such as Verilog or VHDL. QR

EENG 434b / MATH 251b / S&DS 351b, Stochastic Processes Amin Karbasi

Introduction to the study of random processes including linear prediction and Kalman filtering, Poisson counting process and renewal processes, Markov chains, branching processes, birth–death processes, Markov random fields, martingales, and random walks. Applications chosen from communications, networking, image reconstruction, Bayesian statistics, finance, probabilistic analysis of algorithms, and genetics and evolution. Prerequisite: S&DS 241 or equivalent. QR

EENG 436a, Systems and Control Kumpati Narendra

Design of feedback control systems with applications to engineering, biological, and economic systems. Topics include state-space representation, stability, controllability, and observability of discrete-time systems; system identification; optimal control of systems with multiple outputs. Prerequisites: ENAS 194, MATH 222 or 225, and EENG 310 or permission of instructor. QR

* **EENG 437a / AMTH 437a / ECON 413a / S&DS 430a, Optimization Techniques**

Sekhar Tatikonda

Fundamental theory and algorithms of optimization, emphasizing convex optimization. The geometry of convex sets, basic convex analysis, the principle of optimality, duality. Numerical algorithms: steepest descent, Newton's method, interior point methods, dynamic programming, unimodal search. Applications from engineering and the sciences. Prerequisites: MATH 120 and 222, or equivalents. May not be taken after AMTH 237. QR

EENG 445a / BENG 445a, Biomedical Image Processing and Analysis James Duncan and Lawrence Staib

A study of the basic computational principles related to processing and analysis of biomedical images (e.g., magnetic resonance, computed X-ray tomography, fluorescence microscopy). Basic concepts and techniques related to discrete image representation, multidimensional frequency transforms, image enhancement, motion analysis, image segmentation, and image registration. Prerequisite: BENG 352 or EENG 310 or permission of instructors. Recommended preparation: familiarity with probability theory.

EENG 450a, Applied Digital Signal Processing J. Rimantas Vaišnys

An analysis, by computer, of processing requirements. Relevant probability and estimation theories applied to measurements corrupted by noise. Point estimates and system identification from random processes. MATLAB simulations verify the analysis. Prerequisite: EENG 310 or permission of instructor. QR

*** EENG 451b / CPSC 456b, Wireless Technologies and the Internet of Things**

Wenjun Hu

Fundamental theory of wireless communications and its application explored against the backdrop of everyday wireless technologies such as WiFi and cellular networks. Channel fading, MIMO communication, space-time coding, opportunistic communication, OFDM and CDMA, and the evolution and improvement of technologies over time. Emphasis on the interplay between concepts and their implementation in real systems. Prerequisites: 1) Introductory courses in mathematics, engineering, or computer science covering basics of the following topics: Linux skills, Matlab programming, probability, linear algebra, and Fourier transform; 2) Or by permission of the instructor. The course material will be self-contained as much as possible. The labs and homework assignments require Linux and Matlab skills and simple statistical and matrix analysis (using built-in Matlab functions). There will be a couple of introductory labs to refresh Linux and matlab skills if needed.

*** EENG 452a, Internet Engineering** Leandros Tassioulas

Introduction to basic Internet protocols and architectures. Topics include packet-switch and multi-access networks, routing, flow control, congestion control, Internet protocols (IP, TCP, BGP), the client-server model, IP addressing and the domain name system, wireless access networks, and mobile communications. Prerequisite: a college-level course in mathematics, engineering, or computer science, or with permission of instructor. QR

EENG 454b / AMTH 364b / S&DS 364b, Information Theory Andrew Barron

Foundations of information theory in communications, statistical inference, statistical mechanics, probability, and algorithmic complexity. Quantities of information and their properties: entropy, conditional entropy, divergence, redundancy, mutual information, channel capacity. Basic theorems of data compression, data summarization, and channel coding. Applications in statistics and finance. After STAT 241. QR

*** EENG 468a and EENG 469b, Advanced Special Projects** Mark Reed

Faculty-supervised individual or small-group projects with emphasis on research (laboratory or theory), engineering design, or tutorial study. Students are expected to consult the director of undergraduate studies and appropriate faculty members about ideas and suggestions for suitable topics during the term preceding enrollment. This

course may only be taken once and at any appropriate time during the student's career; it does not fulfill the senior requirement. Enrollment requires permission of both the instructor and the DUS, and submission to the latter of a one- to two-page prospectus approved by the instructor. The prospectus is due to the DUS one day prior to the date that the student's course schedule is due.

*** EENG 471a and EENG 472b, Senior Advanced Special Projects** Mark Reed
Faculty-supervised individual or small-group projects with emphasis on research (laboratory or theory), engineering design, or tutorial study. Students are expected to consult the director of undergraduate studies and appropriate faculty members about ideas and suggestions for suitable topics during the term preceding enrollment. This course is only open to seniors and is one of the courses that fulfills the senior requirement. Enrollment requires permission of both the instructor and the DUS, and submission to the latter of a one- to two-page prospectus approved by the instructor. The prospectus is due to the DUS one day prior to the date that the student's course schedule is due.

EENG 475a / BENG 475a / CPSC 475a, Computational Vision and Biological Perception Steven Zucker

An overview of computational vision with a biological emphasis. Suitable as an introduction to biological perception for computer science and engineering students, as well as an introduction to computational vision for mathematics, psychology, and physiology students. Prerequisite: CPSC 112 and MATH 120, or with permission of instructor. QR, SC RP

*** EENG 481b, Advanced ABET Projects** Roman Kuc

Study of the process of designing an electrical device that meets performance specifications, including project initiation and management, part specification, teamwork, design evolution according to real-world constraints, testing, ethics, and communication skills. Design project consists of electronic sensor, computer hardware, and signal analysis components developed by multidisciplinary teams. Prerequisites: EENG 310, 320, 325, and 348. RP

Electrical Engineering and Computer Science

Directors of undergraduate studies: Mark Reed (mark.reed@yale.edu) (Electrical Engineering), 523 BCT, 432-4306; James Aspnes (james.aspnes@yale.edu) (Computer Science), 401 AKW, 432-1232

Electrical Engineering and Computer Science is an interdepartmental major designed for students who want to integrate work in these two fields. It covers discrete and continuous mathematics, algorithm analysis and design, digital and analog circuits, signals and systems, systems programming, and computer engineering. It provides coherence in its core program, but allows flexibility to pursue technical electives.

PREREQUISITES

The prerequisites for the major are MATH 112, 115, and ENAS 151 or MATH 120; CPSC 112 (for students without previous programming experience); and PHYS 180 and 181, or 200 and 201. (PHYS 170, 171 are acceptable for students taking MATH 112.) For the Class of 2022 and subsequent classes, acceleration credits may not be used to satisfy prerequisites. For the Class of 2021 and previous classes, acceleration credits may be used to satisfy some of these requirements. However, because the B.S. programs in Electrical Engineering and in Engineering Sciences (Electrical) both limit the use of such credits, students who wish to retain the option of switching to these programs should consult the director of undergraduate studies (DUS) in Electrical Engineering when planning their course schedules.

REQUIREMENTS OF THE MAJOR

B.S. degree program The major requires fifteen term courses beyond the prerequisites: CPSC 201, 202, 223, 323, and 365 or 366; EENG 200, 201, 202, and 203; one from MATH 222, 225, or S&DS 241; four advanced electives, two in electrical engineering, two in computer science; and a senior project. MATH 244 may be substituted for CPSC 202. Electives must be 300- or 400-level courses in the departments of Electrical Engineering and Computer Science, or must be approved by the DUS in each department. Double-titled courses may be counted either way to fulfill this requirement. CPSC 480 and 490 may not be used as electives. With permission of the DUS in each department, EENG 471 or 472 may be used as an electrical engineering elective.

For students who have taken the equivalent of one year of calculus in high school and have some programming experience, a typical program would be:

First-Year	Sophomore	Junior	Senior
EENG 200	CPSC 201	CPSC 202	Senior project
ENAS 151	EENG 202	CPSC 323	One elective
PHYS 180			
EENG 201	CPSC 223	CPSC 365 or 366	Two electives
PHYS 181	EENG 203	One elective	
	MATH 222		

Students with no programming experience should take CPSC 112 in the fall of their first year and either postpone EENG 200 until their sophomore year or take ENAS 151 or MATH 120 in the spring.

For students with one term of calculus and no programming experience, a typical program would be:

First-Year	Sophomore	Junior	Senior
CPSC 112	CPSC 201	CPSC 202	Two electives
MATH 115	EENG 200	CPSC 323	
PHYS 180	EENG 202	S&DS 241	
EENG 201	CPSC 223	CPSC 365 or 366	Senior project
MATH 120	EENG 203	One elective	One elective
PHYS 181			

For students with no calculus and no programming experience, a typical program would be:

First-Year	Sophomore	Junior	Senior
CPSC 112	CPSC 201	CPSC 202	Two electives
MATH 112	EENG 200	CPSC 323	
PHYS 170	ENAS 151	EENG 202	
EENG 201	CPSC 223	CPSC 365 or 366	Senior project
MATH 115	MATH 222	EENG 203	One elective
PHYS 171		One elective	

Students who start with MATH 112 may satisfy the physics prerequisite by taking PHYS 170 and 171 in their first year, as shown in the table above. However, because the B.S. programs in Electrical Engineering and in Engineering Sciences (Electrical) do not allow this substitution, students who wish to retain the option of switching to these programs should postpone physics until their sophomore year.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

SENIOR REQUIREMENT

The senior project must be completed in CPSC 490 or EENG 471 or 472, depending on the adviser's department, and must be approved by the DUS in each department.

ADVISING AND APPROVAL OF PROGRAMS

The entire program of a student majoring in Electrical Engineering and Computer Science must be approved by the DUS in each department.

Accreditation Students interested in pursuing an ABET-accredited degree should consider the B.S. program in Electrical Engineering. See Electrical Engineering.

REQUIREMENTS OF THE MAJOR

Prerequisites MATH 112, 115, and ENAS 151 or MATH 120; CPSC 112 (students without previous programming experience); PHYS 180, 181, or 200, 201 (PHYS 170, 171 are acceptable for students who need to take MATH 112)

Number of courses 15 term courses beyond prereqs (incl senior project)

Specific courses required CPSC 201, 202, 223, 323, and 365 or 366; EENG 200, 201, 202, and 203; one from MATH 222 or 225 or S&DS 241

Distribution of courses 4 addtl 300- or 400-level electives, 2 in electrical engineering, 2 in comp sci

Substitution permitted MATH 244 for CPSC 202; advanced courses in other depts, with permission of DUS in each dept

Senior requirement Independent project (CPSC 490 or EENG 471 or 472) approved by DUS in each dept

Energy Studies

Program Director: Michael Oristaglio (michael.oristaglio@yale.edu); earth.yale.edu/energy-studies

ENERGY STUDIES MULTIDISCIPLINARY ACADEMIC PROGRAM

Energy Studies is one of four multidisciplinary academic programs in Yale College. The curriculum is designed to provide select undergraduates with the broad knowledge and skills needed for advanced studies, leadership, and success in energy-related fields. The course of study is divided into three tracks—Energy Science and Technology; Energy and the Environment; and Energy and Society—and requires the completion of six graded term courses covering the three tracks plus a senior capstone project, which may take many forms, such as independent study, a summer internship, a senior essay, or a senior project. The Senior Capstone Seminar, ENRG 400, offered in the spring term, allows students to complete the capstone in a credited Yale College course.

Admission to the Energy Studies Undergraduate Scholars program is by application in the fall term of sophomore year. Energy Studies Scholars must complete the requirements of a Yale College major. Yale College does not offer a major in energy studies. For additional information, visit the program website.

Credit/D/Fail No course taken Credit/D/Fail can count for Energy Studies.

REQUIREMENTS OF THE PROGRAM

Prerequisite None

Number of courses 6 courses (does not incl senior req)

Specific courses required APHY 110

Distribution of courses at least one course in each of the three tracks of Energy Studies listed above; and no more than three courses from students' majors can be used to satisfy the six-course requirement

Senior requirement ENRG 400

* **ENRG 400b, Senior Capstone Seminar** Staff

This course serves as the capstone seminar for the Energy Studies Multidisciplinary Academic Program (MAP). Capstone projects in Energy Studies are undertaken in the senior year and can comprise an independent study project or an extension of a summer internship, senior essay or senior project in the major. To register for this course, students must submit a project proposal to the Director of Energy Studies no later than the end of registration period in the term in which the course is to be taken. In addition to individual study, the seminar meets regularly during the term. Prerequisite: Enrollment in, and expected completion of, the course requirements for Energy Studies.

Engineering

Dean of the School of Engineering & Applied Science: Mitchell Smooke, 105 17HH, 432-4200, engineering@yale.edu; seas.yale.edu

Engineering programs are offered in the departments of Biomedical Engineering, Chemical and Environmental Engineering, Computer Science, Electrical Engineering, and Mechanical Engineering and Materials Science. These departments are administered by the Dean of the School of Engineering & Applied Science. The School also offers interdisciplinary courses bearing on engineering programs.

Curricula in Yale's undergraduate engineering and applied science programs range from technically intensive ones to those with lesser technical content that allow students considerable freedom to include courses of a nontechnical nature in their studies. Programs accredited by the Engineering Accreditation Commission of ABET, Inc., the accreditor for university programs in engineering, are the most intensive. ABET-accredited programs include B.S. degrees in Chemical Engineering, Electrical Engineering, and Mechanical Engineering.

Some students find that less intensive programs better meet their needs when considering two majors and/or careers in fields requiring less comprehensive technical knowledge. Such non-ABET programs include the B.S. in Biomedical Engineering, Computer Science, or Environmental Engineering and the B.S. in Engineering Sciences – Chemical, Electrical, or Mechanical – as well as the B.A. in Computer Science or in Engineering Sciences – Electrical, Environmental, or Mechanical – designed for students planning careers in business, law, medicine, journalism, or politics who want their liberal arts education to include study of the impact science and technology have on society. A related major in Applied Mathematics is also available.

For engineering courses and descriptions of the major programs mentioned above, see Applied Mathematics, Biomedical Engineering, Chemical Engineering, Computer Science, Electrical Engineering, Engineering and Applied Science, Environmental Engineering, and Mechanical Engineering.

Engineering and Applied Science

Director of undergraduate studies: Vincent Wilczynski
(vincent.wilczynski@yale.edu), 107 BCT, 432-4221

Courses in Engineering and Applied Science fall into three categories: those intended primarily for students majoring in one of the several engineering and applied science disciplines; those designed for students majoring in subjects other than engineering, the applied sciences, and the natural sciences; and those designed to meet common interests of students majoring in engineering, the applied sciences, or the natural sciences.

In the first category, the departments of Biomedical Engineering, Chemical and Environmental Engineering, Computer Science, Electrical Engineering, and Mechanical Engineering and Materials Science offer courses intended primarily for majors in engineering and applied science disciplines. Courses in these departments may also be relevant for students with appropriate backgrounds who are majoring in chemistry, physics, biology, geology and geophysics, and mathematics. For information about majors in engineering and their related courses, see under Biomedical Engineering, Chemical Engineering, Computer Science, Electrical Engineering, Environmental Engineering, and Mechanical Engineering.

The School of Engineering and Applied Science is responsible for courses in the other two categories: technology for students majoring in subjects other than engineering, the applied sciences, and the natural sciences; and topics common to students majoring in engineering, the applied sciences, and the natural sciences. Courses for non-science majors are intended for all students seeking a broad perspective on issues of scientific and technological import, and they introduce students who may be planning careers in law, business, or public service to concepts and methods of engineering and applied science. Courses for science and engineering majors include topics in applied mathematics and computation.

Courses without Prerequisites in Engineering

* **ENAS 100b / APHY 100b / EVST 100b / G&G 105b / PHYS 100b, Energy Technology and Society** Daniel Prober

The technology and use of energy. Impacts on the environment, climate, security, and economy. Application of scientific reasoning and quantitative analysis. Intended for non-science majors with strong backgrounds in math and science. QR, SC

ENAS 110b / APHY 110b, The Technological World Owen Miller

An exploration of modern technologies that play a role in everyday life, including the underlying science, current applications, and future prospects. Examples include solar cells, light-emitting diodes (LEDs), computer displays, the global positioning system, fiber-optic communication systems, and the application of technological advances to medicine. For students not committed to a major in science or engineering; no college-level science or mathematics required. Prerequisite: high school physics or chemistry.

QR, SC

*** ENAS 120b / CENG 120b / ENVE 120b, Introduction to Environmental Engineering**

John Fortner

Introduction to engineering principles related to the environment, with emphasis on causes of problems and technologies for abatement. Topics include air and water pollution, global climate change, hazardous chemical and emerging environmental technologies. Prerequisites: high school calculus and chemistry or CHEM 161, 165 or CHEM 163, 167 (may be taken concurrently) or permission of instructor. QR, SC

ENAS 345b / CENG 345b, Principles and Applications of Interfacial Phenomena Kyle

Vanderlick

This course covers the nature and consequences of both flexible and rigid interfaces, such as those associated with liquids and solids respectively. We examine the properties of interfaces as they exist alone, as a collective (e.g., colloids), and also as they interact demonstrably with one another. Examples of the latter include thin films, confined fluids and biological membranes. An integral part of this course is the introduction and application of engineering analysis (e.g., finite element analysis) to calculate and predict behaviors central to technological applications. SC

ENAS 360b / ENVE 360b, Green Engineering and Sustainable Design Julie

Zimmerman

Study of green engineering, focusing on key approaches to advancing sustainability through engineering design. Topics include current design, manufacturing, and disposal processes; toxicity and benign alternatives; policy implications; pollution prevention and source reduction; separations and disassembly; material and energy efficiencies and flows; systems analysis; biomimicry; and life cycle design, management, and analysis. Prerequisites: CHEM 161, 165 or 163, 167 (or CHEM 112, 113, or 114, 115), or permission of instructor.

Applied Mathematics and Computation Courses**ENAS 130b, Introduction to Computing for Engineers and Scientists** Beth Anne

Bennett

An introduction to the use of the C and C++ programming languages and the software packages Mathematica and MATLAB to solve a variety of problems encountered in mathematics, the natural sciences, and engineering. General problem-solving techniques, object-oriented programming, elementary numerical methods, data analysis, and graphical display of computational results. Prerequisite: MATH 115 or equivalent. Recommended preparation: previous programming experience. QR

ENAS 151b / APHY 151b / PHYS 151b, Multivariable Calculus for Engineers Beth

Anne Bennett

An introduction to multivariable calculus focusing on applications to engineering problems. Topics include vector-valued functions, vector analysis, partial differentiation, multiple integrals, vector calculus, and the theorems of Green, Stokes, and Gauss. Prerequisite: MATH 115 or equivalent. QR RP

ENAS 194a / APHY 194a, Ordinary and Partial Differential Equations with Applications Beth Anne Bennett

Basic theory of ordinary and partial differential equations useful in applications. First- and second-order equations, separation of variables, power series solutions, Fourier

series, Laplace transforms. Prerequisites: ENAS 151 or equivalent, and knowledge of matrix-based operations. QR RP

ENAS 397a / EENG 397a, Mathematical Methods in Engineering J. Rimas Vaišnys
Exploration of several areas of mathematics useful in science and engineering; recent approaches to problem solving made possible by developments in computer software. Mathematica and Eureka are used to investigate and solve problems involving nonlinear differential equations, complex functions, and partial differential equations.

Prerequisites: MATH 222, and ENAS 194 or MATH 246, or equivalents; familiarity with computer programming. QR

ENAS 441a / MENG 441a, Applied Numerical Methods for Differential Equations

Beth Anne Bennett

The derivation, analysis, and implementation of numerical methods for the solution of ordinary and partial differential equations, both linear and nonlinear. Additional topics such as computational cost, error estimation, and stability analysis are studied in several contexts throughout the course. Prerequisites: MATH 115, and 222 or 225, or equivalents; ENAS 130 or some knowledge of Matlab, C++, or Fortran programming; ENAS 194 or equivalent. ENAS 440 is not a prerequisite. QR

* **ENAS 450b / APHY 450b / MENG 450b, Advanced Synchrotron Techniques and Electron Spectroscopy of Materials** Charles Ahn

Introduction to concepts of advanced x-ray and electron-based techniques used for understanding the electronic, structural, and chemical behavior of materials. Students learn from world-leading experts on fundamentals and practical applications of various diffraction, spectroscopy, and microscopy methods. Course highlights the use of synchrotrons in practical experiments. Prerequisites: physics and quantum mechanics/physical chemistry courses for physical science and engineering majors, or by permission of instructor. QR, SC

English Language and Literature

Director of undergraduate studies: Jessica Brantley (jessica.brantley@yale.edu), 107 LC, 432-2224; **associate director of undergraduate studies:** Sunny Xiang (sunny.xiang@yale.edu), 107 LC, 432-2224; **registrar:** Erica Sayers (erica.sayers@yale.edu), 106 LC, 432-2226; **assistant registrar:** Jane Bordiere (jane.bordiere@yale.edu), 107 LC, 432-2224; english.yale.edu/welcome-english-major

The undergraduate program in English cultivates students' powers of argument and analysis while developing their understanding of important works of English, American, and world literatures in English. Courses offered by the department are designed to teach students foundational research and writing skills; to provide historical perspectives from which to read and analyze literary works; and to deepen students' insight into their own experience. For students interested in creative writing, the department offers an array of courses taught by renowned professional writers in all of the major genres, including fiction, poetry, play and film writing, nonfiction prose, and journalism.

The ability to write well remains a rare but prized skill in almost every domain of our world, and English majors go on to careers in many fields of endeavor. The analytic talents and the writing and speaking skills honed in the major can lead graduates to careers in fields such as advocacy, publishing, teaching, the arts, law, venture capital, medicine, and policy making.

COURSES FOR NONMAJORS AND MAJORS

All English courses are open to both majors and nonmajors, although advanced seminars are intended primarily for junior and senior majors.

Introductory courses Courses numbered from 114–130 are introductory and are open to all students in Yale College. Students planning to elect an introductory course in English should refer to the department website for information about preregistration. Once preregistered, students must attend the first and all subsequent course meetings for that particular section until the end of the second week of classes in order to retain a place. If a student misses a class meeting during this period without informing the instructor beforehand, his or her place will immediately be filled from the waiting list. Students may change their section by attending the desired section. If there are no available seats, the student may be placed on the waiting list for that section.

Advanced courses Advanced courses are open to upper level students; the faculty recommends that students both within and outside the major prepare for such work with two terms of introductory English. Sophomores and juniors are encouraged to enroll in lecture courses in order to gain broad perspectives in preparation for more focused study. Seminars offer more intensive treatment of their topics, which are also often more specialized. While both lectures and seminars are frequently offered more than once, students should not expect the same courses to be offered from one year to the next.

Writing courses Besides introductory courses that concentrate on the writing of expository prose (ENGL 114, 115, 120, and 121), the English department offers a number of creative writing courses. The introductory creative writing course, ENGL 123, is open to any student who has not taken an intermediate or advanced course in the writing

of fiction, poetry, or drama. Interested students must preregister for ENGL 123, but they need not submit a writing sample to gain admission. Many of the more advanced creative writing courses require an application in advance, with admission based on the instructor's judgment of the student's work. Application details and forms for these courses are available on the department website. Students with questions about this process should consult the department registrar. Students may in some cases arrange a tutorial in writing (ENGL 470), normally after having taken intermediate and advanced writing courses. All students interested in creative writing courses should also consult the current listing of residential college seminars.

FOUNDATIONAL COURSES

It is valuable for students majoring in English to have both a detailed understanding of major poets who have written in English and some acquaintance with the classics of American and world anglophone literature. All majors are accordingly required to take three of the four foundational courses from ENGL 125, 126, 127, 128. Prospective English majors are strongly encouraged to complete these requirements by the end of the sophomore year. Those who have not enrolled in the Directed Studies program should also consider taking both ENGL 129 and 130, foundational courses in the European literary tradition.

If, due to a late change of major or other circumstance, it is impossible to take three foundational courses, students may satisfy the requirements of the major by substituting for one foundational course (1) DRST 001 and 002, (2) ENGL 129 and 130, or (3) two advanced courses that deal substantially and intensively with similar material. All substitutions require permission from the director of undergraduate studies (DUS).

REQUIREMENTS OF THE MAJOR

At least fourteen courses are required for the major, including the senior requirement. Each student, in consultation with a departmental faculty adviser, bears the responsibility for designing a coherent program, which must include the following elements:

Each student must take: (1) three foundational courses chosen from ENGL 125, 126, 127, and 128; (2) at least one advanced course (numbered 131 or higher) in each of the following four historical periods, as indicated in the course listings: Medieval, Renaissance, 18th/19th Century, 20th/21st Century; (3) at least one seminar in both the junior and the senior years.

A student whose program meets these requirements may, with permission of the DUS, count as electives toward the major as many as two upper-level courses in other departments. One of these courses should normally be a literature course in English translation or in another language, and neither may be counted toward any requirement of the major. Certain residential college seminars, with permission of the DUS, may also be substituted for electives in the major.

A student may count up to five introductory courses and up to two creative writing courses toward the English major. ENGL 123 counts towards the introductory rather than towards the creative writing limit.

Library requirement Each English major must make an appointment to meet with Yale's Librarian for Literature in English or another research librarian within the first four weeks of the term during which the student is fulfilling the first of the two term senior requirements for the major.

Credit/D/Fail Courses taken Credit/D/Fail may be counted toward the requirements of the major.

THE WRITING CONCENTRATION

The writing concentration is an intensive track for English majors who want more sustained work in creative writing. While there are many ways to pursue creative writing at Yale, and within the English Department, the writing concentration provides a structure for creative work and a community of support that many writers find rewarding. The writing concentration is not a separate degree or certificate; it is a part of the English major and builds on the wealth of its literary offerings. It aims to give English majors with demonstrated interest and achievement in writing an opportunity to plan the writing courses they take in a coordinated way and to do advanced work in tutorial. The writing concentration accepts students with demonstrated commitment to creative writing at the end of the junior year or, occasionally, in the first term of senior year.

Students who enter the writing concentration must fulfill the same requirements as all English majors, except that they count four creative writing courses toward the major, including ENGL 489, a tutorial in which students produce a single sustained piece of writing or a portfolio of shorter works. It is expected that senior applicants will have completed by the end of the fall term the following: (1) at least two creative writing courses numbered 451 or higher, with at least one of these courses in the genre in which they plan to complete ENGL 489 (i.e., poetry, fiction, nonfiction, or drama) and (2) one course in another genre, which may include a creative writing course numbered 131 or higher. Creative writing concentrators must complete at least eleven literature courses in addition to their creative writing courses, for a total of fifteen courses. Residential college seminars are not acceptable for credit toward the writing concentration, except by permission of the DUS. The writing concentration senior project may be offered in partial fulfillment of the senior requirement. Concentrators should fulfill the senior library requirement in the term in which they do the literature component of their senior requirement.

Proposals for the writing concentration should be submitted to the English department office in 107 LC or online as directed on the department website, during the designated sign-up period in the term before enrollment is intended.

SENIOR REQUIREMENTS

Seniors must complete a two-course senior requirement consisting of one of the following combinations: (1) two senior seminars; (2) a senior seminar and a one-term senior essay; (3) a two-term senior essay, with permission of the DUS; (4) a senior seminar or one-term senior essay and the senior project in the writing concentration. Students who wish to complete the senior requirement by the end of the fall term of the senior year may begin it in the spring of the junior year. Each English major must make an appointment to meet with Yale's Librarian for Literature in English or another research librarian within the first four weeks of the term during which the student is

fulfilling the first of the two term requirement for the major. A junior seminar in which the student, with the permission of the DUS and of the instructor, fulfills the senior requirement may be counted as a senior seminar. At the start of term the student must arrange with the instructor to do any additional work necessary to make the course an appropriate capstone experience.

Senior seminar Senior seminars are designated "Senior Seminar" in the course listings, but they are open to interested juniors, as well. The final essays written for senior seminars are intended to provide an appropriate culmination to the student's work in the major and in Yale College. Such essays should rest on significant independent work and should be of substantial length. In researching and writing the essay, the student should consult regularly with the seminar instructor, and may consult with other faculty members as well.

Senior essay The senior essay is an independent literary-critical project on a topic of the student's own design, which is undertaken in regular consultation with a faculty adviser. Writing a senior essay provides a structure for English majors who want the opportunity to explore a research topic in a more sustained and intensive way, as well as a community of support that many majors find rewarding. It should ordinarily be written in an area on which the student has focused in previous studies. It may be written during one or two terms; single-term essays may be converted to two-term essays through application to the DUS. See the course listings for ENGL 490 and 491 for procedures. Students fulfilling the senior requirement through a two-term senior essay or through a senior essay and the senior writing concentration project must take a seminar during their senior year, but it need not be a senior seminar.

Prospectuses and applications for senior essays should be submitted to the office of the English department in 107 LC or online as directed on the department website, during the designated sign-up period in the term before enrollment is intended.

ADVISING

Students planning a program of study in English are strongly encouraged to consult a faculty adviser in the English department, the departmental representative in their residential college, or the DUS for advice about their course choices. A list of departmental representatives is available on the department website.

In the fall of the junior year, each English major formally chooses a faculty adviser from the English department, and, in consultation with that adviser, completes a statement outlining progress in the major. Course schedules for all majors should be discussed with, and approved by, their faculty advisers. The DUS and the ADUS can also discuss and approve schedules, if necessary. Schedules may be submitted to the residential college dean's office only after approval.

Individual programs of study In exceptional cases, a student whose interests and aims are well defined may, in consultation with the DUS, work out a program of study departing from the usual requirements of the major. Such a program must, however, meet the stated general criteria of range and coherence. For interdepartmental programs that include courses covering English literature, see Literature; Directed Studies; American Studies; African American Studies; Ethnicity, Race, and Migration; Theater Studies; and Women's, Gender, and Sexuality Studies.

Graduate school Students considering graduate work in English should be aware that a reading knowledge of certain classical and modern European languages is ordinarily required for admission to graduate study, and that a course orienting them to critical theory can be especially helpful preparation.

Roadmap See visual roadmap of the requirements.

REQUIREMENTS OF THE MAJOR

Number of courses 14 courses (incl senior req)

Distribution of courses 3 courses chosen from ENGL 125, 126, 127, and 128; 1 adv course (numbered 131 or higher) in each of four historical periods as specified; 1 junior seminar; up to 5 courses numbered ENGL 130 or below; up to 2 creative writing courses; *Writing concentration* – same, except 4 creative writing courses including at least 2 numbered 451 or higher, one in same genre as ENGL 489; and 1 in another genre, numbered 131 or higher; at least 11 literature courses

Substitutions permitted DRST 001 and 002 or ENGL 129 and 130 or two upper-level courses with overlapping material may substitute for one foundational course; up to 2 relevant upper-level courses in other departments may substitute for electives in the major; residential college seminars may substitute for electives in the major; all substitutions require DUS permission

Senior requirement *Standard major* – 2 senior sems, or 1 senior sem and 1 senior essay (ENGL 490), or a two-term senior essay (ENGL 490, 491); *Writing concentration* – senior sem or senior essay, and ENGL 489. All seniors must meet with a research librarian in the first term of their senior requirement.

FACULTY OF THE DEPARTMENT OF ENGLISH

Professors Harold Bloom, Jessica Brantley, Leslie Brisman, David Bromwich, Ardis Butterfield, Jill Campbell, Joe Cleary, Michael Denning, Wai Chee Dimock, Anne Fadiman (*Adjunct*), Paul Fry (*Emeritus*), Louise Glück (*Adjunct*), Jacqueline Goldsby, Langdon Hammer, Margaret Homans, Amy Hungerford, David Scott Kastan, Jonathan Kramnick, Traugott Lawler (*Emeritus*), Lawrence Manley, Donald Margulies (*Adjunct*), Stefanie Markovits, Stephanie Newell, John Durham Peters, Caryl Phillips, David Quint, Claudia Rankine, Marc Robinson, John Rogers, Caleb Smith, Robert Stepto (*Emeritus*), Katie Trumpener, Michael Warner, Ruth Yeazell

Associate Professors Marta Figlerowicz, Catherine Nicholson, Emily Thornbury, R. John Williams

Assistant Professors Anastasia Eccles, Ben Glaser, Alanna Hickey, Cajetan Iheka, Naomi Levine, Priyasha Mukhopadhyay, Joseph North, Jill Richards, Sunny Xiang

Senior Lecturers James Berger, Michael Cunningham, Richard Deming, Shifra Sharlin, Cynthia Zarin

Lecturers Felisa Baynes-Ross, Steven Brill, Danielle Chapman, Susan Choi, Andrew Ehrgood, Greg Ellermann, Joseph Gordon, Rona Johnston Gordon, Karin Gosselink, Derek Greene, Rosemary Jones, Heather Klemann, Verlyn Klinkenborg, Timothy Kreiner, Katja Lindskog, Sarah Mahurin, Pamela Newton, Mark Oppenheimer, Timothy Robinson, Karin Roffman, Pamela Schirmeister, Adam Sexton, Kim

Shirkhani, Margaret Spillane, Michele Stepto, Sarah Stillman, Barbara Stuart, Rasheed Tazudeen, Ryan Wepler, Christian Wiman, Bob Woodward

Courses

* **ENGL 010a, Jane Austen** Stefanie Markovits

Close study of Austen's novels, with special attention to the critique of social and literary convention. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

* **ENGL 023b / HUMS 072b, Reading Recent North American Short Fiction** Joseph Gordon

The short story is generally considered to be North American in origin. As one of its goals, the course examines the ways in which the genre has developed in recent decades into a vehicle for storytelling from marginalized or subaltern voices such as those of people of color, women, LGBT people, immigrants and refugees, war veterans, students, and children. The course also explores how collections of stories gathered by a single author may resemble but yet be distinguishable from novels, and examines some very recent short stories that are influenced by nontraditional forms of writing, such as graphic fiction, self-help manuals, and social media. Authors are likely to include: Grace Paley, Alice Munro, Margaret Atwood, Raymond Carver, Lucia Berlin, Sherman Alexie, Tao Lin, Lydia David, Jhumpa Lahiri, Edward P. Jones, Elizabeth Strout, Junot Diaz, Phil Klay, Viet Thanh Nguyen, Alison Bechdel, Nathan Englander, Kristen Rupenian, Jennifer Egan, and Teju Cole. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

* **ENGL 025a / LITR 023a / SAST 059a, Modern South Asian Literature, 1857-2017** Priyasha Mukhopadhyay

Exploration of literary texts from South Asia, 1857 to the present. Close reading of literary texts from India, Pakistan, Bangladesh, and Sri Lanka, alongside political speeches, autobiographies, and oral narratives. Topics include colonialism, history writing, migration, language, caste, gender and desire, translation, politics and the novel. Enrollment limited to first-year students. Preregistration is required; see under First-Year Seminar Program. WR, HU

* **ENGL 027a, Poetry and Protest in America** Alanna Hickey

Survey of poetry's work within social movements from the 1960s to today. Readings range from the Civil Rights, Third World, and Women's Liberation movements of the 1960s, '70s, and '80s to more recent writing from Black Lives Matter, Idle No More, and climate change activists. What radical thinking does poetry make possible within activist contexts? How can we recover and engage in poetry's life off of the page and within workshops, sit-ins, public readings, or artistic collaborations? How might a longer timeline of activist work enrich our understanding of politically-informed poetic composition today? WR, HU

* **ENGL 028b / AFST 028b / LITR 025b, African Literature in the World** Cajetan Iheka

This seminar introduces students to a subset of African literature that has entered the canon of world literature. Bookended by the writings of Chinua Achebe and Chimamanda Adichie, we explore the marks of regional specificity in these works and how they transcend local geographical markers to become worldly artifacts. Our

considerations include why certain texts cross the boundaries of nation and region while others remain confined within territorial bounds. We also examine advantages of the global circulation of African literary works and the pitfalls of a global readership. The class moves from an introductory unit that orients students to African and world literature to focus on close reading of primary texts informed by historical and theoretical nuances. From analyzing works responding to the colonial condition and the articulation of anticolonial sensibilities, to those narrating the African nation at independence and the postcolonial disillusionment that followed, the seminar attends to the formal and thematic implications of globalization for African literary writing. Authors include Chinua Achebe, Mariama Ba, Ngugi wa Thiong'o, Mbolo Mbue, NoViolet Bulawayo, Taiye Selasie, and Chimamanda Adichie. WR, HU

* **ENGL 030b / HUMS 083b, Fantasy in Literature and Film** Alfred Guy
Study of how fantasy ideas about race and gender, good and evil, and religion and culture reflect and influence changing ideas about what it means to be human. Authors include Neil Gaiman, Ursula K. LeGuin, Octavia Butler, & Nalo Hopkinson. Major fantasy films include *Prisoner of Azkaban* and *Get Out*. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

* **ENGL 114a or b, Writing Seminars** Staff
Instruction in writing well-reasoned analyses and academic arguments, with emphasis on the importance of reading, research, and revision. Using examples of nonfiction prose from a variety of academic disciplines, individual sections focus on topics such as the city, childhood, globalization, inequality, food culture, sports, and war. Preregistration required; see under English Department. WR

* **ENGL 115a or b, Literature Seminars** Staff
Exploration of major themes in selected works of literature. Individual sections focus on topics such as war, justice, childhood, sex and gender, the supernatural, and the natural world. Emphasis on the development of writing skills and the analysis of fiction, poetry, drama, and nonfiction prose. Preregistration required; see under English Department. WR, HU

* **ENGL 120a or b, Reading and Writing the Modern Essay** Staff
Close reading of great nonfiction prepares students to develop mastery of the craft of powerful writing in the humanities and in all fields of human endeavor, within the university and beyond. Study of some of the finest essayists in the English language, including James Baldwin, Joan Didion, Leslie Jamison, Jhumpa Lahiri, George Orwell, David Foster Wallace, and Virginia Woolf. Assignments challenge students to craft persuasive arguments from personal experience, to portray people and places, and to interpret fundamental aspects of modern culture. Preregistration required; see under English Department. WR

* **ENGL 121b, Styles of Academic and Professional Prose** Staff
A seminar and workshop in the conventions of good writing in a specific field. Each section focuses on one academic or professional kind of writing and explores its distinctive features through a variety of written and oral assignments, in which students both analyze and practice writing in the field. Section topics, which change yearly, are listed at the beginning of each term on the English departmental website. This course may be repeated for credit in a section that treats a different genre or style of writing; may not be repeated for credit toward the major. Preregistration required; see under

English Department. Prerequisite: ENGL 114, 115, 120, or another writing-intensive course at Yale. WR

*** ENGL 123a, Introduction to Creative Writing** Staff

Introduction to the writing of fiction, poetry, and drama. Development of the basic skills used to create imaginative literature. Fundamentals of craft and composition; the distinct but related techniques used in the three genres. Story, scene, and character in fiction; sound, line, image, and voice in poetry; monologue, dialogue, and action in drama. Preregistration required; see under English Department. HU

*** ENGL 125a, Readings in English Poetry I** Staff

Introduction to the English literary tradition through close reading of select poems from the seventh through the seventeenth centuries. Emphasis on developing skills of literary interpretation and critical writing; diverse linguistic and social histories; and the many varieties of identity and authority in early literary cultures. Readings may include *Beowulf*, *The Canterbury Tales*, Middle English lyrics, *The Faerie Queene*, *Paradise Lost*, and poems by Isabella Whitney, Philip Sidney, William Shakespeare, Amelia Lanyer, John Donne, and George Herbert, among others. Preregistration required; see under English Department. WR, HU

*** ENGL 126a or b, Readings in English Poetry II** Staff

Introduction to the English literary tradition through close reading of select poems from the eighteenth century through the present. Emphasis on developing skills of literary interpretation and critical writing; diverse genres and social histories; and modernity's multiple canons and traditions. Authors may include Alexander Pope, William Wordsworth, Elizabeth Barrett Browning, Robert Browning, W. B. Yeats, T. S. Eliot, Langston Hughes, Gertrude Stein, Gwendolyn Brooks, Elizabeth Bishop, and Derek Walcott, among others. Preregistration required; see under English Department. WR, HU

*** ENGL 127a or b, Readings in American Literature** Staff

Introduction to the American literary tradition in a variety of poetic and narrative forms and in diverse historical contexts. Emphasis on developing skills of literary interpretation and critical writing; diverse linguistic and social histories; and the place of race, class, gender, and sexuality in American literary culture. Authors may include Phillis Wheatley, Henry David Thoreau, Herman Melville, Walt Whitman, Emily Dickinson, Frederick Douglass, Gertrude Stein, Langston Hughes, Ralph Ellison, Flannery O'Connor, Alan Ginsberg, Chang-Rae Lee, and Toni Morrison, among others. Preregistration required; see under English Department. WR, HU

*** ENGL 128a or b, Readings in Comparative World English Literatures** Staff

An introduction to the literary traditions of the Anglophone world in a variety of poetic and narrative forms and historical contexts. Emphasis on developing skills of literary interpretation and critical writing; diverse linguistic, cultural and racial histories; and on the politics of empire and liberation struggles. Authors may include Daniel Defoe, Mary Prince, J. M. Synge, James Joyce, C. L. R. James, Claude McKay, Jean Rhys, Yvonne Vera, Chinua Achebe, Ng#g# wa Thiong'o, J. M. Coetzee, Brian Friel, Amitav Ghosh, Salman Rushdie, Alice Munro, Derek Walcott, and Patrick White, among others. Preregistration required; see under English Department. WR, HU

*** ENGL 129a / LITR 168a, Tragedy in the European Literary Tradition** Staff

The genre of tragedy from its origins in ancient Greece and Rome through the European Renaissance to the present day. Themes of justice, religion, free will, family, gender, race, and dramaturgy. Works include Homer's *Iliad* and plays by Aeschylus, Sophocles, Euripides, Seneca, Shakespeare, Racine, Ibsen, Chekhov, Brecht, Beckett, and Soyinka. Focus on textual analysis and on developing the craft of persuasive argument through writing. Preregistration required; see under English Department.
WR, HU

*** ENGL 130b / LITR 169b, Epic in the European Literary Tradition** Staff

The epic tradition traced from its foundations in ancient Greece and Rome to the modern novel. The creation of cultural values and identities; exile and homecoming; the heroic in times of war and of peace; the role of the individual within society; memory and history; politics of gender, race, and religion. Works include Homer's *Odyssey*, Vergil's *Aeneid*, Dante's *Inferno*, Cervantes's *Don Quixote*, and Joyce's *Ulysses*. Focus on textual analysis and on developing the craft of persuasive argument through writing. Preregistration required; see under English Department. WR, HU

*** ENGL 150a / LING 150a, Old English** Alexandra Reider

An introduction to the language, literature, and culture of earliest England. A selection of prose and verse, including riddles, heroic poetry, meditations on loss, a dream vision, and excerpts from *Beowulf*, which are read in the original Old English. HU

ENGL 154a / FREN 216a / HUMS 134a / LITR 194a, The Multicultural Middle Ages

Ardis Butterfield

Introduction to medieval English literature and culture in its European and Mediterranean context, before it became monolingual, canonical, or author-bound. Genres include travel writing, epic, dream visions, mysticism, the lyric, and autobiography, from the Crusades to the Hundred Years War, from the troubadours to Dante, from the *Chanson de Roland* to Chaucer. HU

ENGL 160b, Milton John Rogers

A study of John Milton's poetry, his engagement with the cultural, social, political, and philosophical struggles of the seventeenth century, and the surprising influence of *Paradise Lost* on eighteenth- and nineteenth-century American letters and religion. WR, HU

ENGL 163b, Vampires, Castles, and Werewolves Heather Klemann

Study of eighteenth- and nineteenth-century gothic fiction and the persistence, resurgence, and adaptation of gothic tropes in twentieth- and twenty-first-century film, television, and prose. Readings include *Frankenstein*, *Northanger Abbey*, *The Strange Case of Dr. Jekyll and Mr. Hyde*, and *Dracula*. Films and TV include *Inception*, *Black Swan*, Alfred Hitchcock's *Rebecca*, and episodes from *Buffy the Vampire Slayer*. Prerequisite: Freshmen must have taken a WR seminar course in the fall term. WR, HU

*** ENGL 182b / AFAM 182b / HUMS 456b, James Baldwin's American Scene**

Jacqueline Goldsby

In-depth examination of James Baldwin's canon, tracking his work as an American artist, citizen, and witness to United States society, politics, and culture during the Civil Rights and Black Arts Movements. WR, HU

ENGL 191a / LITR 318a / NELC 201a, *The Arabian Nights, Then and Now* Shawkat Toorawa

Exploration of *Arabian Nights*, a classic of world literature. Topics include antecedents, themes and later prose, and graphic and film adaptations. HU

ENGL 194a / WGSS 194a, *Queer Modernisms* Jill Richards

Study of modernist literature and the historical formation of homosexual identity from the late nineteenth through mid-twentieth centuries. Topics include: sexology as a medical and disciplinary practice; decadence and theories of degeneration; the criminalization of homosexuality in the Wilde and Pemberton-Billing trials; cross-dressing and drag balls in Harlem; transsexuality and sex-reassignment surgery; lesbian periodical cultures; nightlife and cruising; gay Berlin and the rise of fascism; colonial narratives of same-sex desire in Arabia and the South Pacific; Caribbean sexual morality; and the salon cultures of expatriate Paris. WR, HU

ENGL 196a / FILM 160a, *Introduction to Media* Robert Williams

Introduction to the long history of media as understood in classical and foundational (and even more recent experimental) theories. Topics involve the technologies of modernity, reproduction, and commodity, as well as questions regarding knowledge, representation, public spheres, and spectatorship. Special attention given to philosophies of language, visibility, and the environment, including how digital culture continues to shape these realms. WR, HU

*** ENGL 209a, *Renaissance Lyric*** Lawrence Manley

A survey of English lyric poetry from the early sixteenth century through the mid-seventeenth, focusing on poetic forms and traditions and the place of poetry in the social, political, and religious life of the time. Authors include Wyatt, Sidney, Marlowe, Shakespeare, Aemylia Lanyer, Donne, Jonson, Herbert, Herrick, Milton, Lovelace, and Marvell. WR, HU RP

*** ENGL 210a / HUMS 204a, *The Drama of Justice and Mercy*** Lawrence Manley

An examination of justice, mercy, and the law in drama, film, and writings from disciplines at the intersection of literature, law, ethics, and religion. Reconsidering the usual binaries of convict and victim, self and other, judgment and forgiveness from antiquity to the present, the seminar gives voice to enduring questions about the brokenness of freedom, human rights, and the status of religious belief. Plays by Aeschylus, Shakespeare, Soyinka, and Peter Brook; films by Sidney Lumet, Gavin Hood, and Martin Scorsese; selected readings in philosophy and religion from Plato, Aristotle, the Bible, Montaigne, Hannah Arendt, Martha Nussbaum, and Howard Lesnick; and recent publications on the mass incarceration crisis in the U.S. (Bryan Stevenson's *Just Mercy*; John Pfaff's *Locked In: The True Causes of Mass Incarceration*; Danielle Allen's *Cuz: The Life and Times of Michael A.*). The seminar models a gracious and inclusive learning community, seeking to move past the paralysis that often occurs in well-meaning conversations on politics and controversial social issues. To this end, we welcome students of all backgrounds and majors: theater/performance majors, English majors, non-majors, those with long-standing opinions and insights, and/or those with fresh eyes and genuine interest. WR, HU

*** ENGL 211a / THST 315a, *Acting Shakespeare*** James Bundy

A practicum in acting verse drama, focusing on tools to mine the printed text for given circumstances, character, objective, and action; noting the opportunities and limitations

that the printed play script presents; and promoting both the expressive freedom and responsibility of the actor as an interpretive and collaborative artist in rehearsal. The course will include work on sonnets, monologues, and scenes. Admission by audition. Preference to seniors and juniors; open to nonmajors. HU RP

* **ENGL 214b / THST 207b, Introduction to Dramaturgy** Lynda Paul

Introduction to the discipline of dramaturgy. Study of dramatic literature from the ancient world to the contemporary, developing the core skills of a dramaturg. Students analyze plays for structure and logic; work with a director on production of a classical text; work with a playwright on a new play; and work with an ensemble on a devised piece. WR, HU

* **ENGL 215a, Early Modern Devotional Poetry** John Rogers

A study of the invention of the devotional lyric in English, with a focus on the work of the seventeenth-century poets John Donne, George Herbert, Richard Crashaw, Henry Vaughan, and Thomas Traherne. The impact of this experimental literary movement on such twentieth and twenty-first century critics and poets as T. S. Eliot, William Empson, Simone Weil, Elizabeth Bishop, Anne Carson, and Christian Wiman. WR, HU

* **ENGL 219a / HUMS 149a / ITAL 309a / LITR 179a / WGSS 179a, Gender and Genre in Renaissance Love Poetry** Ayesha Ramachandran

Introduction to the poetic genres of lyric, epic, and pastoral in the European Renaissance. Focus on questions of desire, love, and gendered subjectivity. The historical contexts and political uses of discourses of eroticism and pleasure in Italy, Spain, France, and England. Written exercises include poetic imitations of Renaissance texts. HU

* **ENGL 221b / AFAM 212b, African American Literature in the Archives** Melissa Barton

Examination of African American literary texts within their archival context; how texts were planned, composed, revised, and received in their time. Students pair texts with archival materials from Beinecke Library, including manuscripts, correspondence, photographs, and ephemera. Readings include Lorraine Hansberry, Langston Hughes, James Weldon Johnson, August Wilson, and Richard Wright. HU

* **ENGL 222a / THST 390a, Modern European Drama** Marc Robinson

Intensive study of the major playwrights of modern European drama— Ibsen, Chekhov, Strindberg, Shaw, Brecht, and Beckett— along with pertinent theater theory. WR, HU

* **ENGL 223b / HSAR 479b, Blake and Milton** John Rogers

An interdisciplinary exploration of the Romantic poet William Blake and his literary and visual engagements with the work of the Renaissance poet John Milton. Relying on the unique Blake holdings at the Yale Center for British Art, the course considers not only Blake's Milton, but Blake's artistic and textual treatments of other early modern writers, including Shakespeare, Bacon, Bunyan, and Newton. WR, HU

* **ENGL 232b, Early Native American and Indigenous Print Practices** Alanna Hickey

Survey of Native North American cultures of print through the eighteenth and nineteenth centuries. Explores the continuum between adaptations of European technologies of writing and community-specific practices of graphic communication that pre-date colonization. Questions include: What are the stakes involved in opening up the category of "print" to include non-European practices? How was print used as a

weapon in the fight for representation, land, and sovereignty? How do we read creative print including poetry, novels, and short stories alongside overtly political writings like treaty documents, tribal histories, and speeches?

* **ENGL 234b / AFAM 206b, Literature of the Black South** Sarah Mahurin

Examination of the intersections between African American and Southern literatures, with consideration of the ways in which the American South remains a space that simultaneously represents and repels an African American ethos. HU

* **ENGL 235b / AMST 346b / HUMS 252b, Poetry and Objects** Karin Roffman

This course on 20th and 21st century poetry studies the non-symbolic use of familiar objects in poems. We meet alternating weeks in the Beinecke library archives and the Yale Art Gallery objects study classroom to discover literary, material, and biographical histories of poems and objects. Additionally, there are scheduled readings and discussions with contemporary poets. Assignments include both analytical essays and the creation of online exhibitions. WR, HU

* **ENGL 236b / AMST 330b, Dystopic and Utopian Fictions** James Berger

Attempts since the late nineteenth century to imagine, in literature, cinema, and social theory, a world different from the existing world. The merging of political critique with desire and anxiety; the nature and effects of social power; forms of authority, submission, and resistance. HU

* **ENGL 240b / GLBL 349b, Reporting and Writing on War** Janine di Giovanni

This course examines how to identify, interview, and document human rights violations in the field while reporting on war. It is aimed at students who want to work as journalists, advocates or policy makers, or anyone who wants to work as a practitioner during a conflict or humanitarian crisis. The instructor brings her twenty-five years as a field reporter in war zones into the classroom: the goal is to make the learning functional. The course teaches students how to compile their findings in the form of reports and articles for newspapers, magazines as well as advocacy letters, op-eds, and Blogs. We develop skills for “crunching” talking points for presentations and briefing papers. Each week focuses on a theme and links it to a geographical conflict. Students emerge with practical research, writing, and presentation skills when dealing with sensitive human rights material—for instance, victims’ evidence. Course open only to juniors and seniors. SO RP

* **ENGL 241a / EVST 224a, Writing About The Environment** Alan Burdick

Exploration of ways in which the environment and the natural world can be channeled for literary expression. Reading and discussion of essays, reportage, and book-length works, by scientists and non-scientists alike. Students learn how to create narrative tension while also conveying complex – sometimes highly technical – information; the role of the first person in this type of writing; and where the human environment ends and the non-human one begins.

* **ENGL 250a, Romantic Poetry** Leslie Brisman

Introduction to the work of Blake, Coleridge, Wordsworth, Shelley, and Keats, with some attention to Byron, to the poets’ own problematic revisions, and to the minor poets of this rich period of poetic innovation and revolutionary spirit. WR, HU RP

* **ENGL 251a / WGSS 251a, Experiments in the Novel: The Eighteenth Century** Jill Campbell

The course provides an introduction to English-language novels of the long eighteenth century (1688–1818), the period in which the novel has traditionally been understood to have "risen." Emphasizing the experimental nature of novel-writing in this early period of its history, the course foregrounds persistent questions about the genre as well as a literary-historical survey: What is the status of fictional characters? How does narrative sequence impart political or moral implications? How do conventions of the novel form shape our experience of gender? What kind of being is a narrator? Likely authors include Aphra Behn, Daniel Defoe, Samuel Richardson, Henry Fielding, Laurence Sterne, Maria Edgeworth, Jane Austen, Jennifer Egan, Colson Whitehead, and Richard Powers. WR, HU

* **ENGL 261b, Studies in Eighteenth-Century Prose** David Bromwich

Nonfiction prose of the later eighteenth century, with emphasis on the essays of Hume, the speeches of Burke, and the *Lives of the English Poets* by Samuel Johnson. WR, HU

* **ENGL 263a / HUMS 327a, The Victorian Political Novel** Stefanie Markovits

The engagement of the Victorian novel with the world of politics. Emphasis on how systems interact with individual agents to make stories and how methods such as realism, romance, and the courtship plot portray the mechanics of government. Units on revolution and riot (Dickens and Gaskell), reform (Eliot and Trollope), and anarchy (James and Conrad). WR, HU

* **ENGL 264b / HIST 405Jb, The Real Thing: Forgery and the Authentic, 1500-1800** Kathryn James

This course leads from the premise that our primary relationship with the textual object, and perhaps most particularly to the forged textual object, is epistemological: we want to believe—but in what? We begin with a condensed "boot camp" for approaching objects, introducing some of the specialized and technical knowledge that can help us make sense of what is in front of us. We consider what methods and questions can yield the most complex and intriguing answers, and grapple with our own impulses to make meaning, particularly when it comes to objects that do not quite conform to our expectations (or perhaps conform to our expectations a little too closely, as forged materials often do). WR, HU

* **ENGL 267a, Love and Desire in the Nineteenth Century** Naomi Levine

Exploration of forms of love and desire in Victorian literature, with attention to their philosophical, historical, and aesthetic contexts. How history licensed or constrained the Victorian erotic imagination; how the pleasures of reading and looking shaped nineteenth-century aesthetics; how desire drives literary genres such as the sonnet sequence, the sensation novel, elegy, the love letter, aestheticist prose. Authors may include Elizabeth Barrett Browning, Mary Elizabeth Braddon, William Morris, Christina Rossetti, Walter Pater, Pauline Johnson (Tekahionwake), Michael Field, and Oscar Wilde, with additional readings in Sappho, Dante, Hegel, Stendhal, and Freud. Visits to the Yale art collections inform discussion. WR, HU

* **ENGL 268a / LITR 463 / PHIL 227a, Literature and Philosophy, Revolution to Romanticism** Jonathan Kramnick

This is a course on the interrelations between philosophical and literary writing beginning with the English Revolution and ending with the beginnings of

Romanticism. We read major works in empiricism and moral philosophy alongside poetry and fiction in several genres. We ask, for example, how do poetry, fiction, and the visual arts recruit and account for perceptual experience or consider material and natural objects? What happens when the empirical psychology of consciousness or the categories of the sublime, beautiful, and picturesque take narrative or poetic form? What sort of ethical models follow from formal or generic decisions? WR, HU

* **ENGL 272b / HIST 105Jb / HUMS 352b, American Imagination: From the Gilded Age to the Cold War** David Bromwich and Bryan Garsten

Survey of major ideas, writings, and cultural movements that have shaped American life and thought from 1880 to 1990. Assignments encompass works of fiction, philosophy, social and political thought, and film. HU RP

* **ENGL 275b, Emerson, Dickinson, and Melville** Richard Deming

Study of central works by three foundational writers of the nineteenth century. Cultural and historical context; questions concerning American identity, ethics, and culture, as well as the function of literature; the authors' views on the intersections of philosophy and religious belief, culture, race, gender, and aesthetics. Readings include novels, poems, short fiction, and essays. WR, HU

* **ENGL 281b / AMST 358b, Animals in Modern American Fiction** James Berger

Literary portrayals of animals are used to examine the relations between literature, science, and social and political thought since the late nineteenth century. Topics include Darwinist thought, socialism, fascism, gender and race relations, new thinking about ecology, and issues in neuroscience. HU RP

* **ENGL 287b, Literature and the Future, 1887 to the Present** Robert Williams

A survey of literature's role in anticipating and constructing potential futures since 1887. Early Anglo-American and European futurism during the years leading up to World War I; futures of speculative fiction during the Cold War; futuristic dreams of contemporary cyberpunk. What literature can reveal about the human need to understand both what is coming and how to respond to it. WR, HU

* **ENGL 290b / LITR 261, The Canon in the Colony: Reading English Literature Abroad** Priyasha Mukhopadhyay

Exploration of the life of English literature in the colonial and postcolonial world, from the nineteenth century to the present. Close reading of literary texts, publishing statistics, school textbooks, film, and postcolonial theory. Topics include canon formation, education reform, colonial publishing, gender and education, global Shakespeare. WR, HU

* **ENGL 294b, Novels of Education and Formation** Joseph Cleary

An examination of the *bildungsroman* (novel of formation), *künstlerroman* (artist's novel) educational treatise, and campus novels forms, this course invites students to reflect on the nature and evolution of modern education and the different ways in which the ideals, purposes, challenges, and frustrations of university life especially have been represented from the later nineteenth century to the present. For some, the university has always upheld the interests of traditional elites, privilege and inequality; for others, it should be a transformative institution for overcoming social ills and divisions of class, race, religion, and gender. Beginning with classic nineteenth-century writers including Tocqueville, Arnold, Newman, and Hardy on education and cultural aspiration, the course examines major twentieth-century exponents of the

bildungsroman, *künstlerroman*, and campus novel forms, including distinguished works by Forster, Joyce, Woolf, Waugh, Mary McCarthy, Du Bois, Gandhi, Fanon, Tayib Salih, and J. M. Coetzee, and then concludes with notable twenty-first century works on this subject by Zadie Smith, Jeffrey Eugenides, and Sally Rooney. WR, HU

* **ENGL 295a / AFST 295a / LITR 461a, Postcolonial Ecologies** Staff

This seminar examines the intersections of postcolonialism and ecocriticism as well as the tensions between these conceptual nodes, with readings drawn from across the global South. Topics of discussion include colonialism, development, resource extraction, globalization, ecological degradation, nonhuman agency, and indigenous cosmologies. The course is concerned with the narrative strategies affording the illumination of environmental ideas. We begin by engaging with the questions of postcolonial and world literature and return to these throughout the semester as we read the primary texts, drawn from Africa, the Caribbean, and Asia. We consider African ecologies in their complexity from colonial through post-colonial times. In the unit on the Caribbean, we take up the transformations of the landscape from slavery, through colonialism, and the contemporary era. Turning to Asian spaces, the seminar explores changes brought about by modernity and globalization as well as the effects on both humans and nonhumans. Readings include the writings of Zakes Mda, Aminatta Forna, Helon Habila, Derek Walcott, Jamaica Kincaid, Ishimure Michiko, and Amitav Ghosh. WR, HU

* **ENGL 302b, Chaucer** Ardis Butterfield

A study of a selection of Chaucer's major poems, including *Book of the Duchess*, *House of Fame*, selections from *Troilus and Criseyde*, and *Legend of Good Women*, in addition to selections from his *Canterbury Tales*. WR, HU

* **ENGL 305b, Shakespeare and Religion** David Kastan

This course is about how various understandings of religion (and religions) circulate through Shakespeare's plays, as they were written, performed, and read—and as they have continued to be sometimes re-written, performed, and read. Whatever Shakespeare's own religion was, it is clear that religion is central in the plays: it haunts them (think *Hamlet*) and was in so many ways inescapable in his England. We read a number of plays (including *The Merchant of Venice*, *Hamlet*, *Measure for Measure*, *Othello*, *King Lear*, and *The Winter's Tale*), various historical sources, as well as theological and philosophical texts, as we try to understand how religion functions in these plays as an essential, but often perplexing dimension of early modern identity (and perhaps of our own). HU

* **ENGL 308a / FILM 242a / HUMS 454a / LITR 398a, Interpreting Film Masterpieces**

David Bromwich and Dudley Andrew

Exploration of seven auteurs from Europe and Hollywood, 1937–1967. Assessment of methods that deepen appreciation of the films and the medium. WR, HU

* **ENGL 313a, Poetry and Political Sensibility** Joseph North

Close reading of selected lyric poetry from the twentieth and twenty-first centuries. Focus on ways in which the poems illuminate and engage contemporary habits of political evaluation and response. Poets include Seamus Heaney, Dylan Thomas, W.B. Yeats, W.H. Auden, Lesbia Harford, Pablo Neruda, Bertolt Brecht, Frank O'Hara, Wislawa Szymborska, Edith Södergran, and Audre Lorde. WR, HU

* **ENGL 320a, Novel Feelings** Anastasia Eccles

This course studies the emergence of the modern novel as an event in the history of emotions. The long eighteenth-century saw the rise of the novel as we know it as well as a major intellectual shift in how the passions and emotions were conceptualized. We investigate the relationship between these developments, particularly as they converged in the cultural movement of sentimentalism. With our focus on this historical nexus, we take up broader questions about the ways that aesthetic form mediates the emotions, and the ways that emotion responds to social realities like capitalism, imperialism, secularization and patriarchy. Our focus is on those feelings that might be considered distinctively novelistic – feelings that have influentially served to theorize the novel as a genre (interest for the German romantics; desire for psychoanalytic accounts of narrative), and that novels of the period helped codify and theorize (embarrassment, sympathy, wonder, happiness, complicity). Authors include Eliza Haywood, Daniel Defoe, Laurence Sterne, Henry Mackenzie, Frances Burney, William Beckford, William Godwin, and Jane Austen. WR, HU

* **ENGL 325a / AMST 257a, Modern Apocalyptic Narratives** James Berger

The persistent impulse in Western culture to imagine the end of the world and what might follow. Social and psychological factors that motivate apocalyptic representations. Differences and constant features in apocalyptic representations from the Hebrew Bible to contemporary science fiction. Attitudes toward history, politics, sexuality, social class, and the process of representation in apocalyptic texts. HU

* **ENGL 326a / AMST 406a, The Spectacle of Disability** James Berger

Examination of how people with disabilities are represented in U.S. literature and culture. Ways in which these representations, along with the material realities of disabled people, frame society's understanding of disability; the consequences of such formulations. Various media, including fiction, nonfiction, film, television, and memoirs, viewed through a wide range of analytical lenses. WR, HU RP

* **ENGL 346a / HUMS 253a / RLST 233a, Poetry and Faith** Christian Wiman

Issues of faith examined through poetry, with a focus on modern Christian poems from 1850 to the present. Some attention to poems from other faith traditions, as well as to secular and antireligious poetry. HU

* **ENGL 358b, Literature for Young People** Michele Stepto

An eclectic approach to stories and storytelling for and by children. Authors include Nathaniel Hawthorne, Louisa May Alcott, Carlo Collodi, Jean de Brunhoff, Ursula LeGuin, J. K. Rowling, Maurice Sendak, Kate diCamillo, Christopher Paul Curtis, and Neil Gaiman. WR, HU RP

* **ENGL 369a, Cultures of Militarism in Asia and the Pacific** Sunny Xiang

This seminar explores the diverse cultural manifestations of war, empire, and militarism in Asia and the Pacific during the long Cold War (roughly the 1940s-1980s). A portion of the course is devoted to iconic literary and cultural figures who came to prominence through cultures of militarism (e.g., Jade Snow Wong, James Michener, C.Y. Lee, Richard Mason, Epeli Hau'ofa). We consider important genres privileged by cultural imperialism and soft power (e.g., autobiography, travel writing). We also read more faddish and less canonical writers (e.g., Kim Yong Ik, Induk Pahlk, Janice Mirikitani, Maria Yen) and engage stranger and more ephemeral cultural objects (e.g., advertisements, fashion magazines, tourist guidebooks). Important topics for the

course include refugee migration, the model minority, global education reform, and the belated resurgence of reparation movements. We conclude the semester by examining the Asian American Movement of the 1960s and the publication of Maxine Hong Kingston's *The Woman Warrior* in 1975. WR, HU

* **ENGL 379b, Ulysses and Omeros: The Postcolonial Epic** Joseph Cleary
An extended reading of James Joyce's *Ulysses* (1922) and Derek Walcott's *Omeros* (1990), two of the most ambitious and challenging Anglophone epics of the twentieth century. Beginning with a discussion of the modern epic as prose and poetic form, the class considers Joyce's and Walcott's re-workings of Homeric epic and their respective engagements with the wider Western literary tradition. Questions concerning the structure, style, narrative form, and symbolic meaning of these two exceptionally ambitious works are engaged and we also consider the critical controversies and interpretative challenges that *Ulysses* and *Omeros* have generated and continue to provoke. WR, HU

* **ENGL 384a / FILM 461a / LITR 364a / THST 416a, British Cinema** Katie Trumpener
Survey of the British film tradition, emphasizing overlap with literature, drama, and art; visual modernism; documentary's role in defining national identity; "heritage" filmmaking and alternative approaches to tradition; and auteur and actors' cinema. HU RP

* **ENGL 395a / LITR 154a, The Bible as a Literature** Leslie Brisman
Study of the Bible as a literature—a collection of works exhibiting a variety of attitudes toward the conflicting claims of tradition and originality, historicity and literariness. The course should not be taken concurrently with RLST 145 and is not open to first-year students; but it is open to non-majors who have taken a prior WR course or others who are eager to profit from the progress possible from one to another of the five writing assignments. WR, HU RP

* **ENGL 411b, American Horror Stories** Richard Deming
From its earliest days, the horror genre, although often denigrated, has had a persistent presence in American literature and culture. This course investigates the reasons for this hold on the American imagination and what its social function has been. We explore how the genre is a way that people can navigate questions concerning identity, gender, sexuality, and ethics, as well as grief, loss, and the fear of isolation. We look at the fraught representations of violence, subjectivity, and otherness these works provide. Texts include novels, short fiction, and films. The course is an exciting blend of creative and critical writing. Students write short creative responses and present on specific films and literary texts. The end of the course culminates in a longer project that can be either a scholarly engagement with specific texts and issues or a creative response that explores the ideas arising from the semester's discussions. This allows students to work with the ideas in ways that most suits their strengths and interests. HU

* **ENGL 434a / THST 215a, Writing Dance** Brian Seibert
The esteemed choreographer Merce Cunningham once compared writing about dance to trying to nail Jello-O to the wall. This seminar and workshop takes on the challenge. Taught by a dance critic for the New York Times, the course uses a close reading of exemplary dance writing to introduce approaches that students then try themselves,

in response to filmed dance and live performances in New York City, in the widest possible variety of genres. No previous knowledge of dance is required. WR, HU

* **ENGL 444b / AMST 466b, Contemporary Historical Novels** James Berger
Attempts of contemporary American authors to put the complexities of history into written form. Narrative as the privileged mode of historical representation; differences between what is regarded as academic history, popular history, and historical fiction; the influence of power and of the writer's own historical position on historical narrative; effects of ethnicity, gender, and race on the creation and reception of history; writers' use of historical fiction to change the ways readers think about the present and the future. HU

* **ENGL 450b, Daily Themes** Mark Oppenheimer
Writing of prose at the intermediate level. Daily assignments of c. 300 words, a weekly lecture, and a weekly tutorial. Application forms available on the Web by mid-November. Application open to all undergraduates. Counts as a nonfiction course in the writing concentration. WR

* **ENGL 453a / THST 320a, Playwriting** Donald Margulies
A seminar and workshop on reading for craft and writing for the stage. In addition to weekly prompts and exercises, readings include modern American and British plays by Pinter, Mamet, Churchill, Kushner, Nottage, Williams, Hansberry, Hwang, Vogel, and Wilder. Emphasis on play structure, character, and conflict. RP

* **ENGL 454a, Nonfiction Writing: Voice and Structure** Fred Strebeigh
A nonfiction workshop, confronting the challenges of journalism as an art. Emphasis on voice and structure. Study of texts that may suggest modes, voices, forms, and styles for nonfiction pieces. Frequent writing projects and revisions. WR RP

* **ENGL 455b, Writing about Oneself** Anne Fadiman
A seminar and workshop in first-person writing. Students explore a series of themes (e.g., family, love, loss, identity) both by writing about their own lives and by reading British and American memoirs, autobiographies, personal essays, and letters. An older work, usually from the nineteenth or early twentieth century, is paired each week with a more recent one on the same theme. WR

* **ENGL 456b / HUMS 427b / LITR 348b, The Practice of Literary Translation** Peter Cole
Intensive readings in the history and theory of translation paired with practice in translating. Case studies from ancient languages (the Bible, Greek and Latin classics), medieval languages (classical Arabic literature), and modern languages (poetic texts). HU

* **ENGL 459a / EVST 215a / MB&B 459a, Writing about Science, Medicine, and the Environment** Carl Zimmer
Advanced non-fiction workshop in which students write about science, medicine, and the environment for a broad public audience. Students read exemplary work, ranging from newspaper articles to book excerpts, to learn how to translate complex subjects into compelling prose. Admission by permission of the instructor only. Applicants should email the instructor at carl@carlzimmer.com with the following information:
1. One or two samples of nonacademic, nonfiction writing. (No fiction or scientific papers, please.) Indicate the course or publication, if any, for which you wrote each

sample. 2. A note in which you briefly describe your background (including writing experience and courses) and explain why you'd like to take the course. WR RP

* **ENGL 460a or b, Advanced Poetry Writing** Staff

A seminar and workshop in the writing of verse. May be repeated for credit with a different instructor. RP

* **ENGL 462b / THST 453b, Writing Screenplay Adaptations** Donald Margulies
A workshop on the art of screenplay adaptation. Students read short stories, novels, and non-fiction; the screenplays based on that source material; and view and analyze the final product, the films themselves. Instruction focuses on the form, economy, and structure specific to screenwriting. Weekly writing exercises supplement the creation of a final project: a short screenplay based on source material of the student's choosing.

Previous experience in writing for film or stage would be advantageous but is not required. Restricted to juniors and seniors, or by permission of the instructor. HU

* **ENGL 465a or b, Advanced Fiction Writing** Staff

An advanced workshop in the craft of writing fiction. May be repeated for credit with a different instructor.

* **ENGL 466a, Writing the Contemporary Essay** Cynthia Zarin

A seminar and workshop in the contemporary essay. Public versus private voice, the responsibilities of the essayist, and the evolution of writing in the first person. Readings include essays by Joan Didion, Jonathan Lethem, Jenny Diski, Zadie Smith, M. F. K. Fisher, Bruce Chatwin, John Berger, and Oliver Sacks.

* **ENGL 467a or b / PLSC 253a or b, Journalism** Staff

Examination of the practices, methods, and impact of journalism, with focus on reporting and writing; consideration of how others have done it, what works, and what doesn't. Students learn how to improve story drafts, follow best practices in journalism, improve methods for obtaining, skeptically evaluating, and assessing information, as well as writing a story for others to read. The core course for Yale Journalism Scholars. No prerequisites. WR

* **ENGL 469a, Advanced Nonfiction Writing** Anne Fadiman

A seminar and workshop with the theme "At Home in America." Students consider the varied ways in which modern American literary journalists write about place, and address the theme themselves in both reportorial and first-person work. No prerequisites. WR, HU

* **ENGL 474a, The Genre of the Sentence** Verlyn Klinkenborg

A workshop that explores the sentence as the basic unit of writing and the smallest unit of perception. The importance of the sentence itself versus that of form or genre. Writing as an act of discovery. Includes weekly writing assignments. Not open to freshmen. HU

* **ENGL 477a / THST 321a, Production Seminar: Playwriting** Deborah Margolin

A seminar and workshop in playwriting. Emphasis on developing an individual voice. Scenes read and critiqued in class. Admission by application, with priority to Theater Studies majors. A writing sample and statement of purpose should be submitted to the instructor before the first class meeting.

* **ENGL 478b, Writing about Place** Cynthia Zarin

An exploration of reading and writing about place. Definitions of home; different meanings and intent of travel. Readings include exemplary contemporary essays from the eighteenth century to the present. Workshop for assigned student essays. WR, HU

* **ENGL 480b, Reporting and Crafting the Long-form Narrative** Sarah Stillman

A feature-writing workshop in the reporting and writing of memorable long-form magazine narratives. Close readings of exemplary investigative works. Emphasis on reporting strategies and storytelling tools for interviewing diverse subjects, generating suspense, crafting scenes, and reconstructing events through use of human and non-human sources.

* **ENGL 481b / THST 322b, Advanced Playwriting** Deborah Margolin

A seminar and workshop in advanced playwriting that furthers the development of an individual voice. Study of contemporary and classical plays to understand new and traditional forms. Students write two drafts of an original one-act play or adaptation for critique in workshop sessions. Familiarity with basic playwriting tools is assumed. Open to juniors and seniors, nonmajors as well as majors, on the basis of their work; priority to Theater Studies majors. Writing samples should be submitted to the instructor before the first class meeting. Prerequisite: THST 320 or 321, or a college seminar in playwriting, or equivalent experience. RP

* **ENGL 487a or b / ENGL 470, Tutorial in Writing** Staff

A writing tutorial in fiction, poetry, playwriting, screenwriting, or nonfiction for students who have already taken writing courses at the intermediate and advanced levels. Conducted with a faculty member after approval by the director of undergraduate studies. Students must apply in the previous term; deadlines and instructions are posted at english.yale.edu/undergraduate/applications-and-deadlines. Prerequisites: two courses in writing.

* **ENGL 488a or b, Special Projects for Juniors or Seniors** Staff

Special projects set up by the student in an area of particular interest with the help of a faculty adviser and the director of undergraduate studies, intended to enable the student to cover material not otherwise offered by the department. The course may be used for research or for directed reading, but in either case a term paper or its equivalent is normally required. The student meets regularly with the faculty adviser. To apply for admission, a student must submit an application and prospectus signed by the faculty adviser to the office of the director of undergraduate studies. Students must apply in the previous term; deadlines and instructions are posted at english.yale.edu/undergraduate/applications-and-deadlines.

* **ENGL 489a or b, The Writing Concentration Senior Project** Staff

A term-long project in writing, under tutorial supervision, aimed at producing a single longer work (or a collection of related shorter works). An application and prospectus signed by the student's adviser must be submitted to the office of the director of undergraduate studies by November 16, 2018, for spring-term projects and by April 11, 2019, for fall-term projects. The project is due by the end of the last week of classes (fall term), or the end of the next-to-last week of classes (spring term). Application details and forms are available at english.yale.edu/undergraduate/applications-and-deadlines.

* **ENGL 490a or b, The Senior Essay I** Staff

Students wishing to undertake an independent senior essay in English must apply through the office of the director of undergraduate studies in the previous term; deadlines and instructions are posted at english.yale.edu/undergraduate/applications-and-deadlines. For one-term senior essays, the essay itself is due in the office of the director of undergraduate studies according to the following schedule: (1) end of the fourth week of classes: five to ten pages of writing and/or an annotated bibliography; (2) end of the ninth week of classes: a rough draft of the complete essay; (3) end of the last week of classes (fall term) or end of the next-to-last week of classes (spring term): the completed essay. Consult the director of undergraduate studies regarding the schedule for submission of the yearlong senior essay.

* **ENGL 491a or b, The Senior Essay II** Staff

Second term of the optional yearlong senior essay. Students may begin the yearlong essay in the spring term of the junior year, allowing for significant summer research, with permission of the instructor. Students must apply in the previous term; deadlines and instructions are posted at english.yale.edu/undergraduate/applications-and-deadlines. After ENGL 490.

OTHER COURSES RELATED TO ENGLISH LANGUAGE AND LITERATURE

* **DRST 001a and DRST 002b, Directed Studies: Literature** Staff

An examination of major literary works with an aim of understanding how a tradition develops. In the fall term, works and authors include Homer, Aeschylus, Sophocles, Virgil, the Bible, and Dante. In the spring term, authors vary somewhat from year to year and include Petrarch, Cervantes, Shakespeare, Milton, Wordsworth, Goethe, Tolstoy, Proust, and Eliot. WR, HU

* **HUMS 150a, Shakespeare and the Canon: Histories, Comedies, and Poems** Harold Bloom

A reading of Shakespeare's histories, comedies, and poems, with an emphasis on their originality in regard to tradition and their influence on Western representation since the seventeenth century. Secondary readings included. HU

* **HUMS 151b, Shakespeare and the Canon: Tragedies and Romances** Harold Bloom

A reading of Shakespeare's tragedies and romances, with an emphasis on their originality in regard to tradition: *Hamlet*, *Othello*, *King Lear*, *Macbeth*, and *Antony and Cleopatra*, *The Winter's Tale*, and *The Tempest*. HU

* **HUMS 152a, Poetic Influence from Shakespeare to Keats** Harold Bloom

The complexities of poetic influence in the traditions of the English language, from Shakespeare to Keats. HU

* **HUMS 153b, Poetic Influence from Shakespeare to Hart Crane** Harold Bloom

The complexities of poetic influence in the tradition of the English language. Works by Shakespeare, Milton, Wordsworth, Shelley, Keats, Tennyson, Robert Browning, and Yeats, followed by an American sequence of Whitman, Dickinson, Wallace Stevens, and Hart Crane. HU

THST 110a and THST 111b, Survey of Theater and Drama Shilarna Stokes

An introduction to theater history, plays, aesthetic theories, and performance techniques. From antiquity to the Restoration period in the fall and continuing through to the present in the spring. HU

Environment

At Yale, the environment is studied from a variety of perspectives. Majors are offered in Architecture, Chemical Engineering, Ecology and Evolutionary Biology, Environmental Engineering, Environmental Studies, and Geology and Geophysics and Urban Studies. The program in Forestry & Environmental Studies offers courses in environmental science, policy, and management. Many other departments and programs offer courses pertinent to the study of environment, including American Studies, Anthropology, Chemistry, Economics, English, Global Affairs, History, History of Art, Political Science, Sociology, and Study of the City. Some professional schools and programs offer relevant courses that may admit undergraduates, including Public Health, Forestry & Environmental Studies, the Law School, and the School of Management.

Environmental Engineering

Director of undergraduate studies: John Fortner (john.fortner@yale.edu), 521 17 Hillhouse Ave.; seas.yale.edu/departments/chemical-and-environmental-engineering

Environmental engineering encompasses the scientific assessment and development of engineering solutions to environmental problems affecting land, water, and air (the biosphere). The field embraces broad environmental concerns, including the safety of drinking water, groundwater protection and remediation, wastewater treatment, indoor and outdoor air pollution, solid and hazardous waste disposal, cleanup of contaminated sites, the prevention of pollution through product and process design, and strategies for sustainable water and energy use and production.

Environmental engineers must balance competing technical, social, and legal issues concerning the use of environmental resources. Because of the complexity of these challenges, environmental engineers need a broad understanding not only of engineering disciplines but also of chemistry, biology, geology, and economics. Accordingly, the program allows students in the major to select an emphasis on environmental engineering technology, sustainability, global health, economics, or energy and climate change. The program prepares students for leadership positions in industry and government agencies or for further studies in engineering, science, business, law, and medicine.

Two degree programs are offered: the B.S. in Environmental Engineering, and the B.A. in Engineering Sciences (Environmental). The B.S. degree program in Environmental Engineering is designed for students who desire a strong background in environmental engineering leading to a career in the field. The B.A. degree program in Engineering Sciences (Environmental) is intended for students whose careers will involve, but not be dominated by, the skills of environmental engineering. The B.A. program is appropriate for those contemplating a career in which scientific and technological problems can play an important role, as is often the case in law, business, medicine, or public service.

PREREQUISITES

B.A. degree program in Engineering Sciences (Environmental) The B.A. degree program requires MATH 112 and 115; a two-term lecture sequence in chemistry; and PHYS 170, 171.

B.S. degree program in Environmental Engineering The B.S. degree program has the following prerequisites in mathematics and basic sciences: MATH 112, 115; MATH 120 or ENAS 151; ENAS 194; a two-term lecture sequence in chemistry, with corresponding labs; PHYS 180, 181; and BIOL 101 and 102 or BIOL 103 and 104.

REQUIREMENTS OF THE MAJOR

B.A. degree program The B.A. degree program requires nine term courses beyond the prerequisites, including the senior requirement. Students take ENVE 120, 360, and either ENVE 373 or 377. Five electives must be chosen in consultation with the director of undergraduate studies (DUS).

B.S. degree program The B.S. degree program requires at least twelve term courses beyond the prerequisites, including the senior requirement. Students take CENG 300

or MENG 211, ENVE 120, 360, 373, 377, and either ENVE 315 or 448, EVST 344, and MENG 361 or F&ES 714. At least three electives must be chosen in consultation with the DUS, preferably within one of the following tracks: environmental engineering technology, sustainability, global health, economics, or energy and climate change.

Credit/D/Fail No course taken Credit/D/Fail may count toward the major, including prerequisites.

SENIOR REQUIREMENT

B.A. degree program Students in the B.A. program must pass ENVE 416 or ENVE 490 in their senior year.

B.S. degree program Students in the B.S. program must pass ENVE 416 or ENVE 490 in their senior year.

REQUIREMENTS OF THE MAJOR

ENGINEERING SCIENCES (ENVIRONMENTAL), B.A.

Prerequisites MATH 112, 115; two-term lecture sequence in chemistry; PHYS 170, 171

Number of courses 9 term courses beyond prereqs (incl senior req)

Specific courses required ENVE 120, 360; ENVE 373 or 377

Distribution of courses 5 electives approved by DUS

Senior requirement ENVE 416 or ENVE 490

ENVIRONMENTAL ENGINEERING, B.S.

Prerequisites MATH 112, 115; MATH 120 or ENAS 151; ENAS 194; two-term lecture sequence in chemistry, with labs; PHYS 180, 181; BIOL 101 and 102 or BIOL 103 and 104

Number of courses 12 term courses beyond prereqs (incl senior req)

Specific courses required CENG 300 or MENG 211; ENVE 120, 360, 373, 377; ENVE 315 or 448; EVST 344; MENG 361 or F&ES 714

Distribution of courses 3 electives as specified

Senior requirement ENVE 416 or ENVE 490

FACULTY ASSOCIATED WITH THE PROGRAM IN ENVIRONMENTAL ENGINEERING

Professors Paul Anastas (*Forestry & Environmental Studies*), Michelle Bell (*Forestry & Environmental Studies*), Ruth Blake (*Geology & Geophysics*), Menachem Elimelech (*Chemical & Environmental Engineering*), Edgar Hertwich (*Forestry & Environmental Studies*), Edward Kaplan (*School of Management*), Jaehong Kim (*Chemical & Environmental Engineering*), Jordan Peccia (*Chemical & Environmental Engineering*), Lisa Pfefferle (*Chemical & Environmental Engineering*), Julie Zimmerman (*Chemical & Environmental Engineering*)

Associate Professors John Fortner (*Chemical & Environmental Engineering*), Drew Gentner (*Chemical & Environmental Engineering*)

Courses

* ENVE 120b / CENG 120b / ENAS 120b, Introduction to Environmental Engineering

John Fortner

Introduction to engineering principles related to the environment, with emphasis on causes of problems and technologies for abatement. Topics include air and water

pollution, global climate change, hazardous chemical and emerging environmental technologies. Prerequisites: high school calculus and chemistry or CHEM 161, 165 or CHEM 163, 167 (may be taken concurrently) or permission of instructor. QR, SC

ENVE 315b / CENG 315b, Transport Phenomena Amir Haji Akbari Balou

Unified treatment of momentum, energy, and chemical species transport including conservation laws, flux relations, and boundary conditions. Topics include convective and diffusive transport, transport with homogeneous and heterogeneous chemical reactions and/or phase change, and interfacial transport phenomena. Emphasis on problem analysis and mathematical modeling, including problem formulation, scaling arguments, analytical methods, approximation techniques, and numerical solutions. Prerequisite: ENAS 194 or permission of instructor. QR, SC RP

ENVE 360b / ENAS 360b, Green Engineering and Sustainable Design Julie Zimmerman

Study of green engineering, focusing on key approaches to advancing sustainability through engineering design. Topics include current design, manufacturing, and disposal processes; toxicity and benign alternatives; policy implications; pollution prevention and source reduction; separations and disassembly; material and energy efficiencies and flows; systems analysis; biomimicry; and life cycle design, management, and analysis. Prerequisites: CHEM 161, 165 or 163, 167 (or CHEM 112, 113, or 114, 115), or permission of instructor.

ENVE 373a / CENG 373a, Air Pollution Control Jordan Peccia

An overview of air quality problems worldwide with a focus on emissions, chemistry, transport, and other processes that govern dynamic behavior in the atmosphere. Quantitative assessment of the determining factors of air pollution (e.g., transportation and other combustion-related sources, chemical transformations), climate change, photochemical “smog,” pollutant measurement techniques, and air quality management strategies. Prerequisite: ENVE 120. QR, SC RP

*** ENVE 377a / CENG 377a, Water Quality Control** Jaehong Kim

Study of the preparation of water for domestic and other uses and treatment of wastewater for recycling or discharge to the environment. Topics include processes for removal of organics and inorganics, regulation of dissolved oxygen, and techniques such as ion exchange, electro dialysis, reverse osmosis, activated carbon adsorption, and biological methods. Prerequisite: ENVE 120 or permission of instructor. SC RP

ENVE 416b / CENG 416b, Chemical Engineering Process Design Yehia Khalil

Study of the techniques for and the design of chemical processes and plants, applying the principles of chemical engineering and economics. Emphasis on flowsheet development and equipment selection, cost estimation and economic analysis, design strategy and optimization, safety and hazards analysis, and environmental and ethical considerations. Enrollment limited to seniors majoring in Chemical Engineering or Environmental Engineering. QR, SC RP

ENVE 438a, Environmental Chemistry John Fortner

The quantitative treatment of chemical processes, primarily those involving inorganic chemicals, in aquatic systems such as lakes, oceans, rivers, estuaries, groundwaters, and wastewaters. Review of chemical thermodynamics, followed by discussions of acid-base, precipitation-dissolution, coordination, and reduction-oxidation reactions. Emphasis on equilibrium calculations as a tool for understanding variables that

govern chemical composition of aquatic systems and the fate of inorganic pollutants.

Prerequisite: ENVE 120 and working knowledge of algebra. QR, SC

[**ENVE 448, Environmental Transport Processes**]

[**ENVE 473, Air Quality and Energy**]

* **ENVE 490a or b, Senior Project** John Fortner

Individual research and design projects supervised by a faculty member in Environmental Engineering, or in a related field with permission of the director of undergraduate studies.

Environmental Studies

Director of undergraduate studies: Michael Fotos (michael.fotos@yale.edu), Rm. 107, 115 Prospect St., 436-5190; www.yale.edu/evst

Environmental Studies offers the opportunity to examine human relations with their environments from diverse perspectives. The major encourages interdisciplinary study in (1) social sciences, including anthropology, political science, law, economics, and ethics; (2) humanities, to include history, literature, religion, and the arts; and (3) natural sciences, such as biology, ecology, human health, geology, and chemistry. Students work with faculty advisers and the director of undergraduate studies (DUS) to concentrate on some of the most pressing environmental and sustainability issues of our time: climate change, food and agriculture, urbanism, conservation, energy, sustainable natural resource management, justice, markets, and governance.

Students may pursue either a B.A. or a B.S. degree within Environmental Studies. The B.A. program is intended for students who wish to concentrate in the social sciences and humanities. The B.S. program encourages students to focus in the natural sciences, especially fields such as environmental health and medicine, ecology, and climate science. Both degree programs culminate in a senior essay project that is commonly preceded by independent summer research.

The major for the Class of 2020 With DUS approval, the following changes to the prerequisite and core major requirements of the B.A. degree program may be fulfilled by students who declared their major under previous requirements. There are no changes to the B.S. degree program.

The major for the Class of 2021 and subsequent classes The B.A. degree program does not require any specific prerequisites; there are two new core course major requirements as outlined below. There are no changes to the B.S. degree program.

PREREQUISITES

The B.A. degree program has no prerequisites.

The B.S. degree program requires a natural science laboratory or field course focusing on research and analytic methods chosen from EVST 202L, 221, 234L, 244, 290, 362, or G&G 126L; and a term course in mathematics, physics, or statistics selected from MATH 112 and above (excluding MATH 190), or PHYS 170 and above, or S&DS 101 and above; two-term lecture series in chemistry (or CHEM 170 or CHEM 167), and two terms of biology from BIOL 101 and 102 or 103 and 104, or G&G 125, or MCDB 123.

Students are advised to take chemistry and biology during the first year before enrolling in the EVST core courses in natural sciences. It is recommended that students complete the prerequisites by the end of their sophomore year, although this is not required.

REQUIREMENTS OF THE MAJOR

B.A. degree program The B.A. degree requires at least thirteen course credits, consisting of the core requirements, the concentration, and the senior requirement.

B.S. degree program In addition to the prerequisites, the B.S. degree requires at least twelve course credits, consisting of the core requirements, the concentration, and the two-term senior requirement.

B.A. core courses One course in statistics or mathematics, selected from S&DS 101 or above, or MATH 112 or above; two core courses in the social sciences or humanities selected from EVST 120, 226, 255, 340, or 345; and three natural science core courses. Students may choose natural science courses, all of which have the science (Sc) designation, from EVST 191, 200, 223, 242, 273; E&EB 115 or 145; G&G 120 or 140; G&G 125 or MCDB 123; CHEM 161 or 165; EVST 202L, 221, 234L, 244, 290, 362, or G&G 126L; or CDE 508. Completing one course in each area is recommended before the end of the sophomore year.

B.S. core courses Two core courses in the humanities and social sciences selected from EVST 120, 226, 255, 340, or 345; and two natural science core courses from EVST 200, 223, 242, 273 or G&G 140. Completing one course in each area is recommended before the end of the sophomore year.

Areas of concentration Students plan their concentration in consultation with the (DUS) and the student's adviser. A concentration is defined as six courses that provide analytical depth in a particular environmental problem or issue of interest, as well as disciplinary expertise. One of these six courses must be an advanced seminar (200 level or higher) that exposes students to primary literature, extensive writing requirements, and experience with research methods. For the B.S. degree, three of the six courses must have the science (Sc) designation, and two must provide interdisciplinary context to the concentration. Concentrations include biodiversity and conservation, climate change and energy, environmental humanities, environmental justice, environmental policy, food and agriculture, human health and environment, sustainability and natural resources, and urban environments. Students also have the opportunity to design a unique concentration within the major, in consultation with the DUS.

Credit/D/Fail No course taken Credit/D/Fail may be counted toward the major, including prerequisites.

Roadmap See visual roadmap of the requirements.

SENIOR REQUIREMENT

In the junior year, all students consult with their advisers on the design of their project and submit a preliminary plan to the DUS for approval.

B.A. degree program For the B.A. degree, students most often complete two terms of EVST 496, a colloquium in which they write their senior essay. One-term senior projects require the permission of the DUS, and are generally undertaken only in conjunction with two majors. Only those students who complete a two-term essay are eligible for Distinction in the Major.

B.S. degree program For the B.S. degree, students complete two terms of EVST 496.

ADVISING AND APPLICATION TO THE MAJOR

Students typically apply to enter the major during their sophomore year. Applications are accepted throughout the year; details can be found on the program website. Juniors who have already completed considerable course work toward the major may also apply.

Summer Environmental Fellowship During the summer, many students gain experience in the field through research or internships in an area pertinent to their academic development or their senior essay project. Internships may be arranged with nonprofit organizations, government agencies, or corporations. Although the summer program is optional, many students take advantage of this opportunity with some financial support from the program.

REQUIREMENTS OF THE MAJOR

Prerequisites *B.A.* – no prerequisites; *B.S.* – one course from EVST 202L, 221, 234L, 244, 290, 362, or G&G 126L; MATH 112 and above (excluding MATH 190), or PHYS 170 and above, or S&DS 101 or above; two-term lecture sequence in chem, or CHEM 170 or 167; two terms from BIOL 101 and 102, or 103 and 104, or G&G 125, or MCDB 123

Number of courses *B.A.* – at least 13 course credits, incl senior project; *B.S.* – at least 12 course credits, beyond prereqs and incl senior project

Specific courses required *B.A.* – 6 core courses, as specified; *B.S.* – 2 core courses in humanities and social sciences and 2 core courses in natural sciences, as specified

Distribution of courses *B.A.* – 6 courses in area of concentration, including 1 advanced sem as specified; *B.S.* – 6 courses in area of concentration, 3 of which must have Sc designation, and 2 must provide interdisciplinary context as specified

Senior requirement *B.A.* – one- or two-term research project and colloq (EVST 496); one term research project requires DUS permission; *B.S.* – two-term research project and colloq (EVST 496)

FACULTY ASSOCIATED WITH THE PROGRAM OF ENVIRONMENTAL STUDIES

Professors Gaboury Benoit (*Forestry & Environmental Studies*), Graeme Berlyn (*Forestry & Environmental Studies*), Ruth Blake (*Geology & Geophysics*), Mark Bradford (*Forestry & Environmental Studies*), Derek Briggs (*Geology & Geophysics*), Gary Brudvig (*Chemistry, Molecular Biophysics & Biochemistry*), Benjamin Cashore (*Forestry & Environmental Studies*), Susan Clark (*Adjunct*) (*Forestry & Environmental Studies*), Deborah Coen (*History*), Michael Donoghue (*Ecology & Evolutionary Biology, Forestry & Environmental Studies*), Michael Dove (*Forestry & Environmental Studies, Anthropology*), Menachem Elimelech (*Chemical & Environmental Engineering*), Daniel Esty (*Forestry & Environmental Studies*), Robert Mendelsohn (*Forestry & Environmental Studies, Economics*), Alan Mikhail (*History*), Jeffrey Park (*Geology & Geophysics*), Peter Perdue (*History*), David Post (*Ecology & Evolutionary Biology*), Jeffrey Powell (*Ecology & Evolutionary Biology, Forestry & Environmental Studies*), Peter Raymond (*Forestry & Environmental Studies*), Paul Sabin (*History*), James Saiers (*Forestry & Environmental Studies*), Oswald Schmitz (*Forestry & Environmental Studies, Ecology & Evolutionary Biology*), James Scott (*Political Science, Anthropology*), Karen Seto (*Forestry & Environmental Studies*), Kalyanakrishnan Sivaramakrishnan (*Anthropology, Forestry & Environmental Studies*), David Skelly (*Forestry & Environmental Studies, Ecology & Evolutionary Biology*), Brian Skinner (*Geology & Geophysics*), Ronald Smith

(*Geology & Geophysics, Forestry & Environmental Studies*), Stephen Stearns (*Ecology & Evolutionary Biology*), Charles Tomlin (*Forestry & Environmental Studies*) (*Visiting*), John Wargo (*Forestry & Environmental Studies, Political Science*), Harvey Weiss (*Near Eastern Languages & Civilizations, Anthropology*), Robert Wyman (*Molecular, Cellular, & Developmental Biology*)

Associate Professors Laura Barraclough (*American Studies*), Craig Brodersen (*Forestry & Environmental Studies*), David Vasseur (*Ecology & Evolutionary Biology*), Julie Zimmerman (*Chemical & Environmental Engineering*)

Assistant Professors Anjelica Gonzalez (*Biomedical Engineering*), William Rankin (*History, History of Science*)

Senior Lecturers Shimon Anisfeld, Carol Carpenter, Amity Doolittle, John Grim, Fred Strebeigh

Lecturers Alan Burdick, Ian Cheney, Mary Beth Decker, Marlyse Duguid, Michael Fotos, Kealoha Freidenburg, Gordon Geballe, Linda Puth, Catherine Skinner, Charles Tomlin

Introductory Courses

* **EVST 007a, The New England Forest** Marlyse Duguid

Exploration of the natural history of southern New England, with specific focus on areas in and around New Haven. Pertinent environmental issues, such as climate change, endangered species, and the role of glacial and human history in shaping vegetative patterns and processes, are approached from a multi-disciplinary framework and within the context of the surrounding landscape. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.

* **EVST 020a / F&ES 020a, Sustainable Development in Haiti** Gordon Geballe

The principles and practice of sustainable development explored in the context of Haiti's rich history and culture, as well as its current environmental and economic impoverishment. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR

* **EVST 030b / ARCG 031b / CLCV 059b / HIST 020b / NELC 026b, Rivers and Civilization** Harvey Weiss

The appearance of the earliest cities along the Nile and Euphrates in the fourth millennium B.C. Settlements along the rivers, the origins of agriculture, the production and extraction of agricultural surpluses, and the generation of class structures and political hierarchies. How and why these processes occurred along the banks of these rivers; consequent societal collapses and their relation to abrupt climate changes. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU, SO

* **EVST 040a, Collections of the Peabody Museum** David Skelly

Exploration of scientific questions through the study and analysis of objects within the Peabody Museum's collections. Formulating a research question and carrying out a project that addresses it are the core activities of the course. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SC

* **EVST 100b / APHY 100b / ENAS 100b / G&G 105b / PHYS 100b, Energy Technology and Society** Daniel Prober

The technology and use of energy. Impacts on the environment, climate, security, and economy. Application of scientific reasoning and quantitative analysis. Intended for non-science majors with strong backgrounds in math and science. QR, SC

Core Courses

HUMANITIES AND SOCIAL SCIENCES

EVST 144a / EDST 144a / ER&M 211a / SOCY 144a, Race, Ethnicity, and Immigration

Grace Kao

Exploration of sociological studies and theoretical and empirical analyses of race, ethnicity, and immigration, with focus on race relations and racial and ethnic differences in outcomes in contemporary U.S. society (post-1960s). Study of the patterns of educational and labor market outcomes, incarceration, and family formation of whites, blacks (African Americans), Hispanics, and Asian Americans in the United States, as well as immigration patterns and how they affect race and ethnic relations.

SO

EVST 189b / HIST 246b, The History of Food Paul Freedman

The history of food and culinary styles from prehistory to the present, with a particular focus on Europe and the United States. How societies gathered and prepared food. Changing taste preferences over time. The influence of consumers on trade, colonization, and cultural exchange. The impact of colonialism, technology, and globalization. The current food scene and its implications for health, the environment, and cultural shifts. HU

EVST 226b / ARCG 226b / NELC 268b, Global Environmental History Harvey Weiss

The dynamic relationship between environmental and social forces from the Pleistocene glaciations to the Anthropocene present. Pleistocene extinctions; transition from hunting and gathering to agriculture; origins of cities, states, and civilization; adaptations and collapses of Old and New World civilizations in the face of climate disasters; the destruction and reconstruction of the New World by the Old. Focus on issues of adaptation, resilience, and sustainability, including forces that caused long-term societal change. SO

* **EVST 345a / ANTH 382a / ER&M 395a / F&ES 384a, Environmental Anthropology**

Michael Dove

The history and contemporary study of anthropology and the environment, with special attention to current debates regarding human environmental relations. Topics include: nature-culture dichotomy; ecology and social organization; methodological debates; politics of the environment; and knowing the environment. SO

ENVIRONMENTAL SCIENCE

EVST 223a / E&EB 220a, General Ecology David Vasseur and Ann Staver

The theory and practice of ecology, including the ecology of individuals, population dynamics and regulation, community structure, ecosystem function, and ecological interactions at broad spatial and temporal scales. Topics such as climate change, fisheries management, and infectious diseases are placed in an ecological context.

Prerequisite: MATH 112 or equivalent. SC

Intermediate and Advanced Courses

The following courses have been approved for developing areas of concentration. Other courses may be suitable for designing an area of concentration with permission of the director of undergraduate studies.

EVST 182a / ANTH 300a / E&EB 300a, Primate Behavior and Ecology Eduardo Fernandez-Duque

Socioecology of primates compared with that of other mammals, emphasizing both general principles and unique primate characteristics. Topics include life-history strategies, feeding ecology, mating systems, and ecological influences on social organization. SC, SO

EVST 211b / G&G 211b / HIST 416b / HSHM 211b, Global Catastrophe since 1750 William Rankin

A history of the geological, atmospheric, and environmental sciences, with a focus on predictions of global catastrophe. Topics range from headline catastrophes such as global warming, ozone depletion, and nuclear winter to historical debates about the age of the Earth, the nature of fossils, and the management of natural resources. Tensions between science and religion; the role of science in government; environmental economics; the politics of prediction, modeling, and incomplete evidence. HU

* **EVST 212a / EP&E 390a / PLSC 212a, Democracy and Sustainability** Michael Fotos
Democracy, liberty, and the sustainable use of natural resources. Concepts include institutional analysis, democratic consent, property rights, market failure, and common pool resources. Topics of policy substance are related to human use of the environment and to U.S. and global political institutions. WR, SO

* **EVST 215a / ENGL 459a / MB&B 459a, Writing about Science, Medicine, and the Environment** Carl Zimmer

Advanced non-fiction workshop in which students write about science, medicine, and the environment for a broad public audience. Students read exemplary work, ranging from newspaper articles to book excerpts, to learn how to translate complex subjects into compelling prose. Admission by permission of the instructor only. Applicants should email the instructor at carl@carlzimmer.com with the following information: 1. One or two samples of nonacademic, nonfiction writing. (No fiction or scientific papers, please.) Indicate the course or publication, if any, for which you wrote each sample. 2. A note in which you briefly describe your background (including writing experience and courses) and explain why you'd like to take the course. WR RP

* **EVST 224a / ENGL 241a, Writing About The Environment** Alan Burdick
Exploration of ways in which the environment and the natural world can be channeled for literary expression. Reading and discussion of essays, reportage, and book-length works, by scientists and non-scientists alike. Students learn how to create narrative tension while also conveying complex – sometimes highly technical – information; the role of the first person in this type of writing; and where the human environment ends and the non-human one begins. WR

* **EVST 231a, Temperate Woody Plant Taxonomy and Dendrology** Marlyse Duguid
Identification of the major temperate plant families, with a focus on North American forest species; integration of morphology, phenology, ecology, biogeography, and the natural history of tree species. Course work includes field identification of

woody plants, and phylogenetic systematics as the structure for understanding the evolutionary history and relationships between species. SC

* **EVST 234La, Field Science: Environment and Sustainability** L. Kealoha Freidenburg

A field course that explores the effects of human influences on the environment. Analysis of pattern and process in forested ecosystems; introduction to the principles of agroecology, including visits to local farms; evaluation of sustainability within an urban environment. Weekly field trips and one weekend field trip. SC

* **EVST 247b / EP&E 497b / PLSC 219b, Politics of the Environment** Peter Swenson
Historical and contemporary politics aimed at regulating human behavior to limit damage to the environment. Goals, strategies, successes, and failures of movements, organizations, corporations, scientists, and politicians in conflicts over environmental policy. Focus on politics in the U.S., including the role of public opinion; attention to international regulatory efforts, especially with regard to climate change. SO

* **EVST 258a / AMST 258a, Wilderness in the North American Imagination** Carlos Nugent

The idea of wilderness in American history, art, literature, and public policy. Authors include Henry David Thoreau, Nathaniel Hawthorne, John Muir, Aldo Leopold, John McPhee, and Ramachandra Guha. A class dinner and field trip are held during the term. HU

* **EVST 261a / F&ES 261a / G&G 261a, Minerals and Human Health** Ruth Blake
Study of the interrelationships between Earth materials and processes and personal and public health. The transposition from the environment of the chemical elements essential for life. After one year of college-level chemistry or with permission of instructor; G&G 110 recommended. SC

EVST 265b / G&G 255b, Environmental Geomicrobiology Ruth Blake
Microbial diversity in natural geologic habitats and the role of microorganisms in major biogeochemical cycles. Introduction to prokaryote physiology and metabolic diversity; enrichment culture and molecular methods in geomicrobiology. Prerequisite: college-level chemistry. SC

* **EVST 285b / F&ES 285b, Political Ecology of Tropical Forest Conservation** Amity Doolittle

Study of the relationship between society and the environment focusing on tropical forest conservation. Global processes of environmental conservation, development, and conflicts over natural resource use and control; approaches to conserving trees and forest cover using strategies that support biodiversity and rural agricultural livelihoods; specific focus on tropical forest landscapes dominated by agriculture and cattle ranching practices using Panama and Colombia as a case studies. The course includes an optional field trip during Spring Break: March 17-March 23 in Panama at the ELTI's focal training site. SO

* **EVST 290b / F&ES 290b, Geographic Information Systems** Charles Tomlin
A practical introduction to the nature and use of geographic information systems (GIS) in environmental science and management. Applied techniques for the acquisition, creation, storage, management, visualization, animation, transformation, analysis, and synthesis of cartographic data in digital form.

EVST 292a / GBL 217a / PLSC 149a, Sustainability in the Twenty-First Century: Environment, Energy, and the Economy Daniel Esty

Sustainability as a guiding concept for addressing twenty-first century tensions between economic, environmental, and social progress. Using a cross-disciplinary set of materials from the “sustainability canon,” students explore the interlocking challenges of providing abundant energy, reducing pollution, addressing climate change, conserving natural resources, and mitigating the other impacts of economic development. SO

EVST 318a / AMST 236a / HIST 199a / HSHM 207a, American Energy History Paul Sabin

The history of energy in the United States from early hydropower and coal to present-day hydraulic fracturing, deepwater oil, wind, and solar. Topics include energy transitions and technological change; energy and democracy; environmental justice and public health; corporate power and monopoly control; electricity and popular culture; labor struggles; the global quest for oil; changing national energy policies; the climate crisis. HU

* **EVST 324a / ANTH 322a / SAST 306a, Environmental Justice in South Asia** Staff
Study of South Asia’s nation building and economic development in the aftermath of war and decolonization in the 20th century. How it generated unprecedented stress on natural environments; increased social disparity; and exposure of the poor and minorities to environmental risks and loss of homes, livelihoods, and cultural resources. Discussion of the rise of environmental justice movements and policies in the region as the world comes to grips with living in the Anthropocene. SO

* **EVST 344b / F&ES 344b, Aquatic Chemistry** Gaboury Benoit
A detailed examination of the principles governing chemical reactions in water. Emphasis on developing the ability to predict the aqueous chemistry of natural, engineered, and perturbed systems based on a knowledge of their biogeochemical setting. Calculation of quantitative solutions to chemical equilibria. Focus on inorganic chemistry. Topics include elementary thermodynamics, acid-base equilibria, alkalinity, speciation, solubility, mineral stability, redox chemistry, and surface complexation reactions. SC

* **EVST 362b / ARCG 362b / G&G 362b, Observing Earth from Space** Ronald Smith
A practical introduction to satellite image analysis of Earth’s surface. Topics include the spectrum of electromagnetic radiation, satellite-borne radiometers, data transmission and storage, computer image analysis, the merging of satellite imagery with GIS and applications to weather and climate, oceanography, surficial geology, ecology and epidemiology, forestry, agriculture, archaeology, and watershed management. Prerequisites: college-level physics or chemistry, two courses in geology and natural science of the environment or equivalents, and computer literacy. QR, SC

* **EVST 368b / HIST 491Jb / HSHM 479b / RLST 368b, The History of the Earth from Noah to Darwin** Ivano Dal Prete

Young earth creationism and flood geology have long been among the most divisive features of American culture and politics. Yet a basic postulate is shared across the spectrum: for better or worse, the old age of the Earth is regarded as the recent product of a secular science, consistently rejected by traditional Christianity. This seminar challenges this long-established narrative, by uncovering the surprising boldness,

complexity, and societal diffusion of pre-modern debates on the history of the Earth, and of humankind itself. Students have opportunity to explore the nature, assumptions, and methods of Earth sciences before the advent of modern geology, to question ingrained assumptions about their relation to religion and society, and to place outstanding issues into historical perspective. How have the great monotheistic religions dealt with the possibility of an ancient Earth? Was a young creation always important in traditional Christianity? If not, what led to the emergence of young Earth creationism as a force to be reckoned with? What are the intellectual roots of American preadamism, which claims that the black and white races were created at different times and do not descend from the same ancestor? These and other questions are addressed not only through scholarly literature in the field, but also with the analysis of literary, visual, and material sources available on campus. WR, HU

* **EVST 400b / E&EB 275b, Biological Oceanography** Mary Beth Decker
Exploration of a range of coastal and pelagic ecosystems. Relationships between biological systems and the physical processes that control the movements of water and productivity of marine systems. Anthropogenic impacts on oceans, such as the effects of fishing and climate change. Includes three Friday field trips. Enrollment limited to 15.
SC

* **EVST 415b / BENG 405b, Biotechnology and the Developing World** Anjelica Gonzalez
Study of technological advances that have global health applications. Ways in which biotechnology has enhanced quality of life in the developing world. The challenges of implementing relevant technologies in resource-limited environments, including technical, practical, social, and ethical aspects. Prerequisite: MCDB 120, or BIOL 101 and 102.

* **EVST 424a / ANTH 406a / PLSC 420a, Rivers: Nature and Politics** James Scott
The natural history of rivers and river systems and the politics surrounding the efforts of states to manage and engineer them. SO

* **EVST 463a and EVST 464b / AMST 463a and AMST 464b / FILM 455a and FILM 456b, Documentary Film Workshop** Charles Musser
A yearlong workshop designed primarily for majors in Film and Media Studies or American Studies who are making documentaries as senior projects. Seniors in other majors admitted as space permits. RP

Senior Project

* **EVST 496a or b, Senior Research Project and Colloquium** Michael Fotos
Independent research under the supervision of members of the faculty, resulting in a senior essay. Students meet with peers and faculty members regularly throughout the fall term to discuss the progress of their research. Projects should offer substantial opportunity for interdisciplinary work on environmental problems. Students typically complete a two-term senior essay, but students completing the requirements of two majors may consider a one-term senior project.

Ethics, Politics, and Economics

Director of undergraduate studies: Peter Swenson (peter.swenson@yale.edu), 115 Prospect St., 432-5677; epe.yale.edu

In an era of global interdependence and rapid technological change, we need to think practically about the institutional dynamics of power and governance. We have to understand the technical complexities of economic and statistical analysis at the same time that we think critically about basic moral and political choices. Constructive responses to such problems as coping with natural and social hazards, allocation of limited social resources (e.g., medical care), or morally sensitive political issues (e.g., affirmative action and war crimes) require close knowledge of their political, economic, and social dimensions, and a capacity to think rigorously about the basic questions they raise.

The major in Ethics, Politics, and Economics joins the analytic rigor of the social sciences and the enduring normative questions of philosophy to promote an integrative and critical understanding of the institutions, practices, and policies that shape the contemporary world.

REQUIREMENTS OF THE MAJOR

All students majoring in Ethics, Politics, and Economics must take twelve term courses, including five introductory courses, three core courses (one of which must be an advanced seminar), and four concentration area courses which comprise a student's individual area of concentration. The concentration is developed in consultation with the director of undergraduate studies (DUS) and should culminate in a senior essay written in the area defined by the concentration.

Introductory courses Introductory courses provide a basic familiarity with contemporary economic analysis and survey central issues in ethics and political philosophy. Such a background is necessary to understand theories that combine different approaches to the three areas of inquiry (ethics, politics, economics) and to assess policies with complex political, economic, and moral implications.

The introductory courses include one course from each of the following five topics: ethics, political philosophy, game theory, intermediate microeconomics, and econometrics, and in particular ECON 117 or an equivalent (ECON 135, GLBL 121, S&DS 230, or S&DS 238).

Core courses The major requires that students take three core courses, EP&E 215, and two additional core courses from the major's three core areas, one of which must be an advanced seminar anchored in at least two of the major's three core areas of ethics, politics, or economics. The DUS can offer guidance regarding appropriate courses to fulfill this requirement.

The *Ethics* core draws from courses on normative thinking from philosophy and political science (theory only), or from EP&E courses with Philosophy or Political Science listed as secondary departments.

The *Politics* core includes courses offered by Political Science as the primary department, or EP&E courses with Political Science listed as the secondary department.

The *Economics* core comprises courses offered by Economics as the primary department, or Political Science courses cross-listed with Economics.

Areas of concentration Each student defines an area of concentration in consultation with the DUS. The concentration enables students to frame an important problem and shape a systematic course of inquiry, employing analytical methods and substantive theories drawn from the three fields. Students should not only recognize the accomplishments of varied interdisciplinary efforts, but also attempt to represent and in some cases further develop those accomplishments in their own work.

For many students, the concentration treats a contemporary problem with a substantial policy dimension (domestic or international), but some students may wish to emphasize philosophical and methodological issues. Areas of concentration must consist of four courses appropriate to the theme, including the seminar or independent study course in which the senior essay is written (see "Senior Requirement" below). In designing the area of concentration, students are encouraged to include seminars from other departments and programs. The DUS will also require students to show adequate competence in data analysis when the area of concentration requires it.

The following are examples of possible areas of concentration: distributive justice, government regulation of market economies, environmental policy, philosophy of law, gender relations, democracy and multiculturalism, contemporary approaches to public policy, war and coercion, war crimes and crimes against humanity, medical ethics, international political economy, philosophy of the social sciences, social theory and ethics, cultural analysis and political thought, and civil society and its normative implications. However, students may wish to frame their own concentration more precisely.

Credit/D/Fail Students admitted to the major may take one of their Ethics, Politics, and Economics courses Credit/D/Fail. Such courses count as non-A grades in calculations for Distinction in the Major.

SENIOR REQUIREMENT

A senior essay is required for the major and should constitute an intellectual culmination of the student's work in Ethics, Politics, and Economics. The essay should fall within the student's area of concentration and may be written within a relevant seminar, with the consent of the instructor and approval of the DUS. If no appropriate seminar is offered in which the essay might be written, the student may instead enroll in EP&E 491 with approval of the DUS and a faculty member who will supervise the essay. Students who wish to undertake a more substantial yearlong essay may enroll in EP&E 492, 493.

The senior essay reflects more extensive research than an ordinary Yale College seminar paper and employs a method of research appropriate to its topic. Some papers might be written entirely from library sources; others may employ field interviews and direct observation; still others may require statistical or econometric analysis. The student should consult frequently with the seminar instructor or adviser, offering partial and preliminary drafts for criticism. Students are encouraged to incorporate analysis using the tools of all three of the major's fields.

Senior essays written in the fall term are due on Monday, December 2, 2019. Senior essays written in the spring term and yearlong essays are due on Monday, April 13, 2020. One-term essays are normally expected to be 40–50 pages in length; yearlong essays are normally expected to be 80–100 pages in length.

ADVISING AND APPLICATION TO THE MAJOR

Application to the major Students apply to enter the major at the end of the fall term of their sophomore year. Applications must be submitted via email to the program's registrar, Kellianne Farnham (kellianne.farnham@yale.edu) no later than 4 p.m. on Monday, December 9, 2019. Applications must include the application cover sheet, a current CV, a transcript of work at Yale that indicates fall-term 2019 courses, and a brief application essay, all submitted in a single PDF file. If possible, applicants should include a copy of a paper written for a course related to the subject matter of Ethics, Politics, and Economics. More information regarding the application process and the cover sheet is available on the program website.

Graduate work Some graduate and professional school courses are open to qualified undergraduates and may be of interest to EP&E majors (e.g., courses in the Schools of Nursing, Forestry & Environmental Studies, Management, and Public Health). Permission to enroll is required from the instructor as well as the appropriate representative of the graduate or professional program. Note that not all professional school courses yield a full course credit in Yale College. See Academic Regulations, section K, Special Arrangements, "Courses in the Yale Graduate and Professional Schools."

Roadmap See visual roadmap of the requirements.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 12 (incl senior req)

Specific course required EP&E 215, and ECON 117 or ECON 131 or its equivalent

Distribution of courses 1 introductory course in each of ethics, political phil, game theory, intermediate microeconomics, and econometrics, as specified; 3 core courses (incl EP&E 215 and 1 advanced sem), as specified; 4 courses, incl course for senior req, in area of concentration defined by student in consultation with DUS

Senior requirement Senior essay in area of concentration (in an adv sem or in EP&E 491 or in EP&E 492 and 493)

FACULTY ASSOCIATED WITH THE PROGRAM OF ETHICS, POLITICS, AND ECONOMICS

Professors Seyla Benhabib (*Political Science, Philosophy*), Dirk Bergemann (*Economics*), Donald Brown (*Economics*), David Cameron (*Political Science*), Stephen Darwall (*Philosophy*), Ron Eyerman (*Sociology*), Bryan Garsten (*Political Science*), Jacob Hacker (*Political Science*), Shelly Kagan (*Philosophy*), Joseph LaPalombara (*Emeritus*) (*Political Science*), Giovanni Maggi (*Economics*), William Nordhaus (*Economics*), Thomas Pogge (*Philosophy*), Douglas Rae (*Political Science*), John Roemer (*Political Science*), Susan Rose-Ackerman (*Political Science, Law School*), Frances Rosenbluth (*Director*) (*Political Science*), Ian Shapiro (*Political Science*), Jason Stanley (*Philosophy*), Peter Swenson (*Political Science*), Steven Wilkinson (*Political Science*)

Senior Lecturer Boris Kapustin (*Political Science*)

Lecturers Elaine Dezenski (*Global Studies*), Michael Fotos (*Political Science*), Karen Goodrow (*Political Science*), Stephen Latham (*Political Science*)

Courses

EP&E 203a / PLSC 452a / S&DS 102a, Introduction to Statistics: Political Science

Jonathan Reuning-Scherer

Statistical analysis of politics, elections, and political psychology. Problems presented with reference to a wide array of examples: public opinion, campaign finance, racially motivated crime, and public policy. QR

EP&E 209a / PLSC 453a / S&DS 103a, Introduction to Statistics: Social Sciences

Jonathan Reuning-Scherer

Descriptive and inferential statistics applied to analysis of data from the social sciences. Introduction of concepts and skills for understanding and conducting quantitative research. QR

*** EP&E 215a or b, Classics of Ethics, Politics, and Economics** Staff

A critical examination of classic and contemporary works that treat problems of ethics, politics, and economics as unities. Topics include changing conceptions of private and public spheres, the content and domain of individual freedom, and ethical and political limits to the market. Readings from the works of Aristotle, Hobbes, Locke, Smith, Bentham, Mill, Hegel, Marx, Hayek, Rawls, and others. HU, SO

*** EP&E 232b / ECON 470b / GLBL 233b, Strategies for Economic Development**

Rakesh Mohan

How strategies for economic development have changed over time and how dominant strands in development theory and practice have evolved. Students trace the influence of the evolution in thinking on actual changes that have taken place in successful development strategies, as practiced in fast growing developing countries, and as illustrated in case studies of fast growth periods in Japan, South Korea, Brazil, China, and India. Prerequisites: introductory microeconomics and macroeconomics.

*** EP&E 234a / AFST 234a, Market Liberalism, Socialist Planning, and Ideas of Development** Nicoli Natrass

Exploration of market liberalism, socialist planning, and contestation over the role of the state in the idea of development. Study of key classical economists; Marxism and Utopian socialism; how collectivisation was applied in the Soviet Union and in the African context; and discussion of the rise of development economics, highlighting the work of W. Arthur Lewis and Amartya Sen. Prerequisite: ECON 110 or 115, or permission of the instructor. SO

*** EP&E 235a / PHIL 457a / PLSC 283a, Recent Work on Justice** Thomas Pogge
In-depth study of one contemporary book, author, or debate in political philosophy, political theory, or normative economics. Focus varies from year to year based on student interest and may include a ground-breaking new book, the life's work of a prominent author, or an important theme in contemporary political thought. HU

* **EP&E 243a / GLBL 336a / LAST 423a / PLSC 423a, Political Economy of Poverty Alleviation** Ana De La O

Overview of classic and contemporary approaches to the question of why some countries have done better than others at reducing poverty. Emphasis on the role of politics. SO

* **EP&E 245a / PLSC 152a, Global Firms and National Governments** Joseph LaPalombara

Interactions between large-scale firms that make international investments and policy makers and government officials in the “host” countries. National and subnational officials who work to attract investments (or not) and who set policies regulating global firms and their investments. Focus on less-developed countries. Theories as to why firms “globalize”; case studies of controversies created by overseas corporate investments; the changing economic landscape associated with investments by countries such as China, Brazil, and India. SO

* **EP&E 248b / PLSC 256b, American Political Institutions** Michael Fotos

The origins and development of American political institutions, especially in relation to how institutions shape the policy process. Issues of temporality, policy feedback, and policy substance. WR, SO

* **EP&E 250a / PLSC 354a, The European Union** David Cameron

Origins and development of the European Community and Union over the past fifty years; ways in which the often-conflicting ambitions of its member states have shaped the EU; relations between member states and the EU's supranational institutions and politics; and economic, political, and geopolitical challenges. SO

* **EP&E 253b / PLSC 398b, Comparative Political Economy** Frances Rosenbluth

Introduction to issues in political economy across time and place. The field's diverse theoretical underpinnings and its place in the context of political science and of the social sciences more generally; theoretical perspectives such as materialism, institutionalism, and cognition/culture/beliefs; interactions between government and the economy in democratic and nondemocratic regimes and in developed and developing countries. Enrollment limited to senior Political Science majors. SO

* **EP&E 254a / ECON 454a / GLBL 331a, Evolution of Central Banking** Rakesh Mohan

Changes in the contours of policy making by central banks since the turn of the twentieth century. Theoretical and policy perspectives as well as empirical debates in central banking. The recurrence of financial crises in market economies. Monetary policies that led to economic stability in the period prior to the collapse of 2007–2008. Changes in Monetary Policies since the Great Financial Crisis. Prerequisite: ECON 122. SO

* **EP&E 286a / ECON 475a, Discrimination in Law, Theory, and Practice** Gerald Jaynes

How law and economic theory define and conceptualize economic discrimination; whether economic models adequately describe behaviors of discriminators as documented in court cases and government hearings; the extent to which economic theory and econometric techniques aid our understanding of actual marketplace discrimination. Prerequisites: introductory microeconomics and at least one additional

course in Economics, African American Studies, Ethnicity, Race, and Migration, or Women's, Gender, and Sexuality Studies.

EP&E 295a / PLSC 344a, Game Theory and Political Science Ian Turner

Introduction to game theory—a method by which strategic interactions among individuals and groups in society are mathematically modeled—and its applications to political science. Concepts employed by game theorists, such as Nash equilibrium, subgame perfect equilibrium, and perfect Bayesian equilibrium. Problems of cooperation, time-consistency, signaling, and reputation formation. Political applications include candidate competition, policy making, political bargaining, and international conflict. No prerequisites other than high school algebra. Political Science majors who take this course may not count ECON 159 toward the major. QR, SO

* **EP&E 298a / ECON 481a, Empirical Microeconomics** Guillermo Noguera

Introduction to empirical microeconomics and its methodologies. Academic research in the field explored using tools from economic theory and econometrics. Topics include approaches to identification, environmental effects on health, and the economics of crime, gender, and race. Prerequisites: intermediate microeconomics and econometrics. SO

* **EP&E 306a / PLSC 228a, First Amendment and Ethics of Law** Karen Goodrow

This course addresses the First Amendment and freedom of speech, focusing on the ethical implications of restrictions on free speech, as well as the exercise of free speech. Course topics and discussions include the “fighting words” doctrine, hate speech, true threats, content regulated speech, freedom of speech and the internet, and the so-called “right to be forgotten.” By the end of the course, students recognize the role free speech plays in society, including its negative and positive impacts on various segments of society. Students also have an understanding of the competing interests arising from the First Amendment’s right to free speech, and can analyze how these competing interests are weighed and measured in the United States as compared with other countries. SO

* **EP&E 312a / PLSC 297a, Moral Choices in Politics** Boris Kapustin

A study of how and why people make costly moral choices in politics. Figures studied include Thomas More, Abraham Lincoln, Nelson Mandela, Václav Havel, and Aung San Suu Kyi. SO

EP&E 315b / PLSC 317b, Constitutionalism Giulia Oskian

An introduction to the political philosophy of constitutionalism combined with a trans-historical and comparative study of constitution-making processes including the US, France, Mexico, Germany, Italy, and India.

EP&E 321b / ECON 325b / SAST 281b, Economics of Developing Countries: Focus on South Asia Zachary Barnett-Howell

Analysis of current problems of developing countries. Emphasis on the role of economic theory in informing public policies to achieve improvements in poverty and inequality, and on empirical analysis to understand markets and responses to poverty. Topics include microfinance, education, health, agriculture, intrahousehold allocations, gender, and corruption. Prerequisites: introductory microeconomics and introductory econometrics. SO

* **EP&E 324b / PLSC 244b, Journalism, Liberalism, Democracy** James Sleeper
The news media's role in configuring the democratic public sphere, from the early synergy of print capitalism and liberalism through the corporate consolidation of mass media and the recent fragmentation and fluidity of "news." Classical-humanist and civic-republican responses to these trends. SO

* **EP&E 325b / PLSC 304, Business Ethics and Law** Robin Landis
This seminar is intended to provide frameworks for the analysis of ethical issues that may arise in the context of business decisions, including such aspects as the role of ethics, competing values and interests, and tools for making principled decisions. The course also covers, as appropriate, some aspects of law as they relate to business ethics. Previous courses in philosophy and ethics may be helpful. SO

* **EP&E 328b / PLSC 347b / S&DS 172b, YData: Data Science for Political Campaigns**
Joshua Kalla
Political campaigns have become increasingly data driven. Data science is used to inform where campaigns compete, which messages they use, how they deliver them, and among which voters. In this course, we explore how data science is being used to design winning campaigns. Students gain an understanding of what data is available to campaigns, how campaigns use this data to identify supporters, and the use of experiments in campaigns. This course provides students with an introduction to political campaigns, an introduction to data science tools necessary for studying politics, and opportunities to practice the data science skills presented in S&DS 123, YData.

Prerequisite: S&DS 123, which may be taken concurrently. QR ½ Course cr

EP&E 329a / DEVN 198a / GLBL 444a / HIST 122a / PLSC 405a, Power and Politics in Today's World Ian Shapiro

A comparative study of power and politics since the Cold War. Topics include the decline of trade unions and increased influence of business; growing inequality and insecurity; changing attitudes towards democracy and authoritarianism; and the character and durability of the new international order. We start with the impact of the USSR's collapse, both in former communist countries and the West, focusing on reordered relations among business, labor, and governments. Next we take up the Washington Consensus on free trade, privatization, and deregulation, and agendas to fight terrorism, prevent human rights abuses, and spread democracy. Then we turn to the backlash that followed the financial crisis, as technocratic elites lost legitimacy, the global war on terror became mired in quagmires, and humanitarian intervention and democracy-spreading agendas floundered. The new politics of insecurity is our next focus. We examine the populist explosions of 2016 and the politics to which they have given rise. This leads to a consideration of responses, where we discuss the policies most needed when congenial employment insecurity is going to be the norm, and the political reforms that would increase the chances of those policies being adopted. Introductory courses in twentieth-century European, American or global history, comparative politics, or political economy are helpful but are not required. HU, SO

* **EP&E 334b / PHIL 455b, Normative Ethics** Shelly Kagan
A systematic examination of normative ethics, the part of moral philosophy that attempts to articulate and defend the basic principles of morality. The course surveys and explores some of the main normative factors relevant in determining the moral status of a given act or policy (features that help make a given act right or wrong). Brief

consideration of some of the main views about the foundations of normative ethics (the ultimate basis or ground for the various moral principles). Prerequisite: a course in moral philosophy. HU

* **EP&E 339b / PLSC 273b, The Ethics of Journalism** Jacob Weisberg

An examination of key issues about the rights and responsibilities of the press. Topics include truth and verification, bias and objectivity, the handling of government secrets, the use of misrepresentation and deception, privacy, and the protection of sources. Case studies including WikiLeaks and the Pentagon Papers will supplement readings from critics such as Walter Lippmann, George Orwell, Janet Malcolm, and Neil Postman.

* **EP&E 353b / PLSC 305b, Critique of Political Violence** Boris Kapustin

Methods of conceptualizing political violence that are prevalent in contemporary political philosophical discourse. Use of theoretical-analytical tools to examine the modes violence assumes and the functions it performs in modern political life as well as the meanings and possibilities of nonviolence in politics. SO

* **EP&E 380a / PLSC 313a, Bioethics, Politics, and Economics** Stephen Latham

Ethical, political, and economic aspects of a number of contemporary issues in biomedical ethics. Topics include abortion, assisted reproduction, end-of-life care, research on human subjects, and stem cell research. SO

* **EP&E 390a / EVST 212a / PLSC 212a, Democracy and Sustainability** Michael Fotos

Democracy, liberty, and the sustainable use of natural resources. Concepts include institutional analysis, democratic consent, property rights, market failure, and common pool resources. Topics of policy substance are related to human use of the environment and to U.S. and global political institutions. WR, SO

* **EP&E 421b / PLSC 320b, Ethics, Law, and Current Issues** Karen Goodrow

Examination of how freedom of speech and bias influence the criminal justice system, focusing on wrongful convictions and administration of the death penalty. Understanding the role of potential bias at various levels and the competing interests of protecting speech, due process, and the innocent. Topics include limitations on speech, practical effects of speech, the efficacy of the death penalty, actual innocence, gender/race/economic bias and its effects on the justice system, as well as best practices for improving our sense of justice.

* **EP&E 471a or b, Directed Reading and Research** Peter Swenson

For individual reading and research unrelated to the senior essay. Students must obtain the signature of the faculty member supervising their independent work on an Independent Study Form (available from the Ethics, Politics, and Economics registrar's office). This form must be submitted to the director of undergraduate studies at the time the student's class schedule is submitted.

* **EP&E 478b / PHIL 450b, The Problem of Evil** Keith DeRose

The challenge that evil's existence in the world poses for belief in a perfectly good and omnipotent God. The main formulations of the problem of evil; proposed ways of solving or mitigating the problem and criticism of those solutions. Skeptical theism, the free-will defense, soul-making theodicies, and doctrines of hell. HU

* **EP&E 490a / CGSC 426a / PHIL 426a / PSYC 422a, The Cognitive Science of Morality** Joshua Knobe

Introduction to the emerging field of moral cognition. Focus on questions about the philosophical significance of psychological findings. Topics include the role of emotion in moral judgment; the significance of character traits in virtue ethics and personality psychology; the reliability of intuitions and the psychological processes that underlie them. HU

* **EP&E 491a or b, The Senior Essay** Peter Swenson

A one-term senior essay. The essay should fall within the student's area of concentration. If no appropriate seminar is offered in which the essay might be written, the student, in consultation with the director of undergraduate studies, should choose an appropriate member of the faculty to supervise the senior essay. Students must obtain the signature of the faculty member supervising their independent work on an Independent Study Form (available from the Ethics, Politics, and Economics registrar's office). This form must be submitted to the director of undergraduate studies at the time the student's class schedule is submitted.

* **EP&E 492a and EP&E 493b, The Yearlong Senior Essay** Peter Swenson

A two-term senior essay. The essay should fall within the student's area of concentration. The student, in consultation with the director of undergraduate studies, should choose an appropriate member of the faculty to supervise the senior essay. Students must obtain the signature of the faculty member supervising their independent work on an Independent Study Form (available from the Ethics, Politics, and Economics registrar's office). This form must be submitted to the director of undergraduate studies at the time the student's class schedule is submitted.

EP&E 494b / AFAM 198b / CGSC 277b / EDST 177b / PHIL 177b, Propaganda, Ideology, and Democracy Jason Stanley

Historical, philosophical, psychological, and linguistic introduction to the issues and challenges that propaganda raises for liberal democracy. How propaganda can work to undermine democracy; ways in which schools and the press are implicated; the use of propaganda by social movements to address democracy's deficiencies; the legitimacy of propaganda in cases of political crisis. HU

* **EP&E 497b / EVST 247b / PLSC 219b, Politics of the Environment** Peter Swenson

Historical and contemporary politics aimed at regulating human behavior to limit damage to the environment. Goals, strategies, successes, and failures of movements, organizations, corporations, scientists, and politicians in conflicts over environmental policy. Focus on politics in the U.S., including the role of public opinion; attention to international regulatory efforts, especially with regard to climate change. SO

* **EP&E 499a / AFST 400a / PLSC 401a, Democratic Politics and Public Policy in Contemporary Africa** Jeremy Seekings

Examination of how the resurgence of competitive, multi-party elections in Africa has reinvigorated democratic governance and transformed the process of public policy-making. Emphasis on the political landscape of public opinion and voting behavior; elections and political parties; the state and governance; as well as policy-making, with focus on economic and social policies. SO

OTHER COURSES RELATED TO ETHICS, POLITICS, AND ECONOMICS

PHIL 175b, Introduction to Ethics Shelly Kagan

What makes one act right and another wrong? What am I morally required to do for others? What is the basis of morality? These are some of the questions raised in moral philosophy. Examination of two of the most important answers, the theories of Mill and Kant, with brief consideration of the views of Hume and Hobbes. Discussion of the question: Why be moral? HU

PLSC 114a, Introduction to Political Philosophy Hélène Landemore

Fundamental issues in contemporary politics investigated through reflection on classic texts in the history of political thought. Emphasis on topics linked to modern constitutional democracies, including executive power, representation, and political parties. Readings from Plato, Machiavelli, Hobbes, Locke, Rousseau, Madison and Hamilton, Lincoln, and Tocqueville, in addition to recent articles on contemporary issues. SO

PLSC 118b, The Moral Foundations of Politics Ian Shapiro

An introduction to contemporary discussions about the foundations of political argument. Emphasis on the relations between political theory and policy debate (e.g., social welfare provision and affirmative action). Readings from Bentham, Mill, Marx, Burke, Rawls, Nozick, and others. SO

Ethnicity, Race, and Migration

Director of undergraduate studies: Ana Ramos-Zayas (ana.ramos-zayas@yale.edu), Rm. 204, 35 Broadway, 436-9316, erm.yale.edu

The program in Ethnicity, Race, and Migration enables students to engage in an interdisciplinary, comparative study of forces that have created a multicultural, multiethnic, and multiracial world. The major emphasizes familiarity with the intellectual traditions and debates surrounding the concepts of indigeneity, ethnicity, nationality, and race; grounding in both the history of migration and its contemporary manifestations; and knowledge of and direct engagement with the cultures, structures, and peoples formed by these migrations.

REQUIREMENTS OF THE MAJOR

The major for the Class of 2020 With approval from the director of undergraduate studies (DUS), the following changes to the requirements of the major may be fulfilled by students who declared their major under previous requirements.

The major for the Class of 2021 and subsequent classes Students must complete twelve term courses in Ethnicity, Race, and Migration, including the senior requirement. These twelve normally include ER&M 200, an introductory course on the issues and disciplines involved in the study of ethnicity, race, and migration. In the junior year, all majors are required to take ER&M 300, a seminar that introduces majors to scholarship in ethnic studies, postcolonial studies, and cultural studies. Students also take two electives; courses with ER&M content taught in related departments, such as Sociology, Political Science, History, and Anthropology require DUS approval.

Area of concentration In consultation with the DUS, each student defines an area of concentration consisting of six term courses, one of which must be a methods course; these concentration courses do not include the senior essay or project. Advanced work in the foreign language related to a student's area of concentration is advised.

Roadmap See visual roadmap of the requirements.

SENIOR REQUIREMENT

There are two options for the senior requirement. Majors may choose a yearlong senior essay or project and take the senior colloquium (ER&M 491) on theoretical and methodological issues in the fall and then complete the requirement by writing a senior essay in the senior project seminar (ER&M 492) during the spring term. Alternatively, students may take two upper-level ER&M seminars, and in one of the seminars, with the instructor's approval, write a final paper of 30–35 pages in addition to completing other course requirements. These seminars may be taken during either the fall or spring term.

ADVISING

Prospective majors should consult the director of undergraduate studies early in their academic careers to discuss an individual plan of study. Enrollment in the major requires permission of the director of undergraduate studies prior to the beginning of the fall term of the junior year.

As a multidisciplinary program, Ethnicity, Race, and Migration draws on the resources of other departments and programs in the University. Students are encouraged to examine the offerings of other departments in both the humanities and the social sciences, interdisciplinary programs of study housed in the MacMillan Center and elsewhere, and residential college seminars for additional relevant courses. The stated area of concentration of each student determines the relevance and acceptability of other courses. Students are also encouraged to engage in community-based learning opportunities.

STUDY ABROAD

Because of the major's emphasis on international and transnational work, students are encouraged to undertake a term abroad. They should consult with the DUS to identify courses from study abroad programs that may count toward the major.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 12 term courses (incl senior req)

Specific courses required ER&M 200, 300

Distribution of courses 6 courses in area of concentration, 1 of which must be a methods course; 2 electives with ER&M content and DUS approval

Senior requirement Senior colloq (ER&M 491) and senior essay or project (ER&M 492); or senior essay in upper-level seminar and one additional upper-level seminar

FACULTY ASSOCIATED WITH THE PROGRAM OF ETHNICITY, RACE, AND MIGRATION

Professors Ned Blackhawk (*History, American Studies*), Hazel Carby (*African American Studies, American Studies*), Michael Denning (*American Studies, English*), Inderpal Grewal (*American Studies, Women's, Gender, & Sexuality Studies*), Matthew Jacobson (*American Studies, African American Studies, History*), Gilbert Joseph (*History*), Grace Kao (*Sociology*), Mary Lui (*American Studies, History*), Stephen Pitti (*History, American Studies*), Ana Ramos-Zayas (*American Studies, Ethnicity, Race, and Migration, Women's, Gender, & Sexuality Studies*), Alicia Schmidt Camacho (*Ethnicity, Race, and Migration, American Studies*)

Associate Professors Laura Barraclough (*American Studies*), Zareena Grewal (*American Studies*), Daniel Martínez HoSang (*American Studies, Ethnicity, Race, and Migration*), Daniel Magaziner (*History*)

Assistant Professors Albert Laguna (*American Studies, Ethnicity, Race, and Migration*), Sunny Xiang (*English*)

Lecturers Aaron Carico (*American Studies, African American Studies*), Leah Mirakhor (*American Studies, Ethnicity, Race, and Migration*), Joanna Radin (*History of Science & Medicine, History, Anthropology, American Studies, Ethnicity, Race, and Migration*), David Simon (*Political Science*), Quan Tran (*American Studies, Ethnicity, Race, and Migration*)

Visiting Lecturer Gary Okihiro

Required Courses

ER&M 200a, Introduction to Ethnicity, Race, and Migration Alicia Camacho
Historical roots of contemporary ethnic and racial formations and competing theories of ethnicity, race, and migration. Cultural constructions and social practices of race, ethnicity, and migration in the United States and around the world. HU, SO

* **ER&M 300a or b, Comparative Ethnic Studies** Staff

Introduction to the methods and practice of comparative ethnic studies. Examination of racial formation in the United States within a transnational framework. Legacies of colonialism, slavery, and racial exclusion; racial formation in schools, prisons, and citizenship law; cultural politics of music and performance; social movements; and postcolonial critique. SO

Electives within the Major

AFAM 162b / AMST 162b / HIST 187b, African American History from Emancipation to the Present Staff

An examination of the African American experience since 1861. Meanings of freedom and citizenship are distilled through appraisal of race and class formations, the processes and effects of cultural consumption, and the grand narrative of the civil rights movement. WR, HU

* **AFAM 410b / AMST 310b / WGSS 410b, Interdisciplinary Approaches to African American Studies** Crystal Feimster

An interdisciplinary, thematic approach to the study of race, nation, and ethnicity in the African diaspora. Topics include class, gender, color, and sexuality; the dynamics of reform, Pan-Africanism, neocolonialism, and contemporary black nationalism. Use of a broad range of methodologies. WR, HU, SO

* **AMST 405b / AFAM 406b, Autobiography in America** Robert Stepto

A study of autobiographical writings from Mary Rowlandson's Indian captivity narrative (1682) to the present. Classic forms such as immigrant, education, and cause narratives; prevailing autobiographical strategies involving place, work, and photographs. Authors include Franklin, Douglass, Jacobs, Antin, Kingston, Uchida, Balakian, Rodriguez, and Bechdel. WR, HU

* **AMST 410a / HIST 166Ja / WGSS 409a, Asian American Women and Gender, 1830 to the Present** Mary Lui

Asian American women as key historical actors. Gender analysis is used to reexamine themes in Asian American history: immigration, labor, community, cultural representations, political organizing, sexuality, and marriage and family life. WR, HU

* **ANTH 366a / AMST 435a, Inequality in America** Kathryn Dudley

Sociocultural dimensions of social inequality in the contemporary United States. Ways in which the socioeconomic processes that produce inequality are inextricably embedded in worlds of cultural meaning; how those meanings are constructed and embodied in everyday practice. Perspectives from anthropology, sociology, economics, history, and popular media. SO

ER&M 206a / PLSC 437a / SOCY 223a, The Politics of Ethnic and National Identity

Maria Jose Hierro

Introduction to the study of ethnic and national identity, their determinants and consequences in comparative perspective. SO

ER&M 211a / EDST 144a / EVST 144a / SOCY 144a, Race, Ethnicity, and Immigration

Grace Kao

Exploration of sociological studies and theoretical and empirical analyses of race, ethnicity, and immigration, with focus on race relations and racial and ethnic differences in outcomes in contemporary U.S. society (post-1960s). Study of the patterns of educational and labor market outcomes, incarceration, and family formation of whites, blacks (African Americans), Hispanics, and Asian Americans in the United States, as well as immigration patterns and how they affect race and ethnic relations. SO

*** ER&M 221b / AMST 206b / WGSS 222b, Introduction to Critical Refugee Studies**

Quan Tran

Reconfiguring refugees as fluid subjects and sites of social, political, and cultural critiques. Departing from dominant understandings of refugees as victims, consideration instead of refugees as complex historical actors, made visible through processes of colonization, imperialism, war, displacement, state violence, and globalization, as well as ethical, social, legal, and political transformations. Focus on second-half of the twentieth century. SO

ER&M 223a / AMST 209a / PLSC 262a, Race, Politics, and the Law Daniel HoSang

Examination of how race—as a mode of domination and resistance—has developed and transformed in the United States since the early-twentieth-century. How political actors and social movements engage the law to shape visions of freedom, democracy, and political life. Consideration of critical race theory, political discourse analysis, intersectionality and women of color feminism, and American political development. SO

ER&M 238a / AFAM 192a / AFST 238a / AMST 238a, Introduction to Third World Studies Gary Okihiro

Introduction to the historical and contemporary theories and articulations of Third World studies (comparative ethnic studies) as an academic field and practice. Consideration of subject matters; methodologies and theories; literatures; and practitioners and institutional arrangements. SO

*** ER&M 320a / AMST 335a, Indigenous Geographies** Laura Barraclough

This seminar examines the spatiality of indigenous communities, both on their own terms and in relationship to ongoing processes of settler colonialism. Focusing primarily on indigenous geographies and place-making practices in the settler United States, it explores the survivance and creativity of Native peoples in the face of persistent spatial violence. While rooted in the intellectual traditions of critical indigenous studies, we also engage scholarship from history, geography, architecture and planning, anthropology, sociology, and education. Topics include: land-based ways of knowing, relations of care, and identity/community formation; treaties, relocation, and reservation-making; ideologies and practices of property; urbanization, urban indigenous communities, and urban activism; cartography and Geographic Information Systems (GIS); movement and mobility; environmental justice hazards

and activism; public memory, monuments, and place-names; the significance of borders (both national and local), especially in relationship to violence; and place-based efforts toward co-existence and solidarity in a more-than-human world. No formal prerequisites; prior coursework in Native American history or studies is helpful, but not required. HU, SO

ER&M 325a or b / AFST 335a or b / HIST 335a or b, A History of South Africa Daniel Magaziner

An introduction to the history of southern Africa, especially South Africa. Indigenous communities; early colonial contact; the legacies of colonial rule; postcolonial mismanagement; the vagaries of the environment; the mineral revolution; segregationist regimes; persistent inequality and crime since the end of apartheid; the specter of AIDS; postcolonial challenges in Zimbabwe, Angola, and Mozambique. HU

* **ER&M 342a / HIST 372Ja / LAST 372a, Revolutionary Change and Cold War in Latin America** Gilbert Joseph

Analysis of revolutionary movements in Latin America against the backdrop of the Cold War. Critical examination of popular images and orthodox interpretations. An interdisciplinary study of the process of revolutionary change and cold war at the grassroots level. WR, HU

* **ER&M 349a / AFAM 227a / AMST 227a / HIST 137Ja, From the Voting Rights Act to #blacklivesmatter** Staff

This course explores the period beginning from 1964 through the emergence of the #blacklivesmatter movement in 2013. Key concepts covered in this course include the Black Panther Party and rise of the Black Power movement; political campaigns of Shirley Chisholm, Jesse Jackson, and Barack Obama. The seminar concludes with an examination of the #blacklivesmatter movement and broader efforts addressing mass incarceration, poverty, and opportunity gaps in education. HU

* **ER&M 370a / AMST 441a / HIST 130Ja, Indians and the Spanish Borderlands** Ned Blackhawk

The experiences of Native Americans during centuries of relations with North America's first imperial power, Spain. The history and long-term legacies of Spanish colonialism from Florida to California. WR, HU

* **ER&M 376b / MGRK 304b / PLSC 376b / SOCY 307b, Extreme and Radical Right Movements** Paris Aslanidis

Extreme and radical right movements and political parties are a recurrent phenomenon found in most parts of the world. Discussion of their foundational values and the causes of their continuous, even increasing, support among citizens and voters. SO

* **ER&M 380a / AFAM 373a / AMST 355a, White America** Aaron Carico

Critical exploration of how the whiteness of the United States and its institutions has been developed and maintained from the nineteenth century into the present. Special attention paid to the intersection of race and class, particularly to the position of poor whites. Examination of the politics and culture of American whiteness, texts include histories, literary essays, fiction, and films. HU

* **ER&M 387a, Migrants and Borders in the Americas** Alicia Camacho

Migration and human mobility across North America, with a focus on 1994 to the present. Critical and thematic readings examine Central America, Mexico, and the United States as integrated spaces of migration, governance, and cultural and social

exchange. Migrant social movements, indigenous migration, gender and sexual dynamics of migration, human trafficking, crime and social violence, deportation and detention, immigration policing, and militarized security. HU, SO

* **ER&M 395a / ANTH 382a / EVST 345a / F&ES 384a, Environmental Anthropology**

Michael Dove

The history and contemporary study of anthropology and the environment, with special attention to current debates regarding human environmental relations. Topics include: nature-culture dichotomy; ecology and social organization; methodological debates; politics of the environment; and knowing the environment. SO

* **ER&M 407a / AFAM 399a / AMST 341a, Race and Capitalism** Aaron Carico

This interdisciplinary seminar explores, both theoretically and historically, how racial formations are bound to the formations of capitalism. Focus on the American scene, with sustained inquiry on slavery, its commodity logics, and their residues. Consideration of the effects of immigration and globalization. SO

* **ER&M 409a / AMST 345a / WGSS 408a, Latinx Ethnography** Ana Ramos-Zayas

Consideration of ethnography within the genealogy and intellectual traditions of Latinx Studies. Topics include: questions of knowledge production and epistemological traditions in Latin America and U.S. Latino communities; conceptions of migration, transnationalism, and space; perspectives on "(il)legality" and criminalization; labor, wealth, and class identities; contextual understandings of gender and sexuality; theorizations of affect and intimate lives; and the politics of race and inequality under white liberalism and conservatism in the United States. SO

* **ER&M 416b / GMAN 411b / HUMS 342b / JDST 327b / LITR 406b, World**

Literature Hannan Hever

The concept of world literature, from its origins in eighteenth-century cosmopolitanism represented by Herder and Goethe up to contemporary critical debates (Apter, Casanova, Cheah, Damrosch, Dharwadker, I. Hesse, Moretti, Mufti, Pollock, Said, Spivak). World literature in relation to national literature, German-language, and Jewish literature; translation, untranslatability, the effect of markets, diaspora, politics. Literary critical readings supplemented by exemplary literary texts in multiple genres. Student contributions based on individual linguistic backgrounds. HU

* **ER&M 419a / AFAM 390a / SOCY 319a, Ethnography of the African American**

Community Elijah Anderson

An ethnographic study of the African American community. Analysis of ethnographic and historical literature, with attention to substantive, conceptual, and methodological issues. Topics include the significance of slavery, the racial ghetto, structural poverty, the middle class, the color line, racial etiquette, and social identity. SO

* **ER&M 425a / AMST 486a, Asian American Studies of Race, Colonialism, and**

Empire Lisa Lowe

This interdisciplinary course examines three periods of Asian American history that are paradigmatic within Asian American Studies of race, colonialism, and empire: 19th century Chinese immigrant labor, the internment of Japanese and Japanese Americans during World War II, and Korean Americans in 1992 Los Angeles. Studying these three examples in their national and global contexts, we consider Chinese immigrant railroad workers in relation to both conditions for emigration from China, and to Native American responses to U.S. settlement and expansion into the western frontier;

the dispossession and incarceration of Japanese Americans in relation to wartime racialization of Mexican Americans, Blacks, and the longer history of U.S. war in Asia; and finally, we seek to understand the positioning of Korean Americans as "middlemen" in post-Civil Rights multiracial Los Angeles in relation to Korean War, and U.S. development and investment in the industrialization of South Korea. We explore how Asian American histories of racialized labor and citizenship in the U.S. are better understood in comparative relation to the histories of other groups, and with consideration of the longer histories of U.S. interventions in Asian countries of origin.

HU

* **ER&M 435b / AMST 422b / HIST 151Jb, Writing Tribal Histories** Ned Blackhawk
Historical overview of American Indian tribal communities, particularly since the creation of the United States. Challenges of working with oral histories, government documents, and missionary records. WR, HU

* **ER&M 437a / THST 437a, Performance behind Bars: Sacred Music, Sacred Texts, and Social Justice** Ronald Jenkins

Through the study of theatrical works that have been adapted from sacred texts, the course introduces students to playwriting techniques helpful for writing their own scripts based on a socially conscious reading of sacred texts. Possible collaboration with incarcerated and formerly incarcerated individuals in adapting Dante's *Divine Comedy* for the stage. HU

* **ER&M 439a / AMST 439a, Fruits of Empire** Gary Okihiro

Readings, discussions, and research on imperialism and "green gold" and their consequences for the imperial powers and their colonies and neo-colonies. Spatially conceived as a world-system that enmeshes the planet and as earth's latitudes that divide the temperate from the tropical zones, imperialism as discourse and material relations is this seminar's focus together with its implantations – an empire of plants. Vast plantations of sugar, cotton, tea, coffee, bananas, and pineapples occupy land cultivated by native and migrant workers, and their fruits move from the tropical to the temperate zones, impoverishing the periphery while profiting the core. Fruits of Empire, thus, implicates power and the social formation of race, gender, sexuality, class, and nation. HU, SO

* **ER&M 462a / AMST 462a / WGSS 463a, The Study of Privilege in the Americas**
Ana Ramos-Zayas

Examination of inequality, not only through experiences of the poor and marginal, but also through institutions, beliefs, social norms, and everyday practices of the privileged. Topics include: critical examination of key concepts like "studying up," "elite," and "privilege," as well as variations in forms of capital; institutional sites of privilege (elite prep schools, Wall Street); living spaces and social networks (gated communities, private clubs); privilege in intersectional contexts (privilege and race, class, and gender); and everyday practices of intimacy and affect that characterize, solidify, and promote privilege. SO

HIST 119b / AFAM 172b, The Civil War and Reconstruction Era, 1845–1877 David Blight

The causes, course, and consequences of the American Civil War. A search for the multiple meanings of a transformative event, including national, sectional, racial, constitutional, social, gender, intellectual, and individual dimensions. HU

HIST 264b / RSEE 268b, Eastern Europe since 1914 Staff

Eastern Europe from the collapse of the old imperial order to the enlargement of the European Union. Main themes include world war, nationalism, fascism, and communism. Special attention to the structural weaknesses of interwar nation-states and postwar communist regimes. Nazi and Soviet occupation as an age of extremes. The collapse of communism. Communism after 1989 and the dissolution of Yugoslavia in the 1990s as parallel European trajectories. HU

HIST 303b, Japan's Modern Revolution Daniel Botsman

A survey of Japan's transformation over the course of the nineteenth century from an isolated, traditional society on the edge of northeast Asia to a modern imperial power. Aspects of political, social, and cultural history. HU

HIST 332a / AFST 333a, African Encounters with Colonialism Daniel Magaziner

How African societies and peoples encountered, engaged, and endured the colonial and postcolonial world, from the arrival of Kiswahili-speaking traders at the shores of Lake Victoria in the 1840s through the rise and fall of European colonialism and the resulting forms of neocolonialism. Transformations and continuities in African religious life; gendered sociability; popular culture. HU

HIST 335a or b / AFST 335a or b / ER&M 325a or b, A History of South Africa Daniel Magaziner

An introduction to the history of southern Africa, especially South Africa. Indigenous communities; early colonial contact; the legacies of colonial rule; postcolonial mismanagement; the vagaries of the environment; the mineral revolution; segregationist regimes; persistent inequality and crime since the end of apartheid; the specter of AIDS; postcolonial challenges in Zimbabwe, Angola, and Mozambique. HU

*** PORT 394a / LAST 394a / LITR 294a, World Cities and Narratives** K. David Jackson

Study of world cities and selected narratives that describe, belong to, or represent them. Topics range from the rise of the urban novel in European capitals to the postcolonial fictional worlds of major Portuguese, Brazilian, and Spanish American cities. Conducted in English. WR, HU TR

*** SOCY 319a / AFAM 390a / ER&M 419a, Ethnography of the African American Community** Elijah Anderson

An ethnographic study of the African American community. Analysis of ethnographic and historical literature, with attention to substantive, conceptual, and methodological issues. Topics include the significance of slavery, the racial ghetto, structural poverty, the middle class, the color line, racial etiquette, and social identity. SO

*** THST 335a / AFST 435a, West African Dance: Traditional to Contemporary** Lacina Coulibaly

A practical and theoretical study of the traditional dances of Africa, focusing on those of Burkina Faso and their contemporary manifestations. Emphasis on rhythm, kinesthetic form, and gestural expression. The fusion of modern European dance and traditional African dance. Admission by audition during the first class meeting. HU RP

WGSS 405a / EALL 211a / EAST 241a / LITR 174a, Women and Literature in Traditional China Kang-i Sun Chang

A study of major women writers in traditional China, as well as representations of women by male authors. The power of women's writing; women and material culture;

women in exile; courtesans; Taoist and Buddhist nuns; widow poets; cross-dressing women; the female body and its metaphors; footbinding; notions of love and death; the aesthetics of illness; women and revolution; poetry clubs; the function of memory in women's literature; problems of gender and genre. All readings in translation; no knowledge of Chinese required. Some Chinese texts provided for students who read Chinese. Formerly CHNS 201. HU TR

Individual Research and Senior Essay Courses

* ER&M 491a, **The Senior Colloquium: Theoretical and Methodological Issues**

Quan Tran

A research seminar intended to move students toward the successful completion of their senior projects, combining discussions of methodological and theoretical issues with discussions of students' fields of research.

* ER&M 492b, **The Senior Essay or Project** Quan Tran

Independent research on a one-term senior essay or project.

Film and Media Studies

Director of undergraduate studies: Katerina Clark (katerina.clark@yale.edu), Rm. 203, 451 College St., 432-0712; Camille Thomasson (camille.thomasson@yale.edu), Rm. 316, 53 Wall St., 432-3048; filmstudies.yale.edu

The major in Film and Media Studies focuses on the history, theory, criticism, and production of cinema and other moving-image media. Courses examine cinema and the broader landscape of audiovisual media as significant modern art forms, and the contributions of moving-image media as cultural and communicative practices of enduring social significance. As an interdisciplinary program centered in the humanities, Film and Media Studies offers students latitude in defining their course of study within the framework established by the Film and Media Studies Committee. With this freedom comes the responsibility of carefully planning a coherent and well-focused program. Because of the special demands of Film and Media Studies and the diversity of its offerings, potential majors are encouraged to consult the director of undergraduate studies (DUS) early in their academic careers.

PREREQUISITE

Students normally take FILM 150 in their first or second year. This course is useful preparation, and in some cases a prerequisite for other courses in the major.

REQUIREMENTS OF THE MAJOR

The Film and Media Studies major consists of twelve term courses, including the prerequisite and the senior requirement. Students are required to take FILM 160 and FILM 320, preferably by the end of their sophomore year. In addition, students are required to take one upper-level course in the study of representative films from a non-American national cinema (e.g. German expressionist cinema, Italian cinema, or world cinema) and one course in critical studies. Students also must take at least one course on the creative process in film; appropriate courses are listed under "Production Seminars." Courses taken outside the Film and Media Studies department do not count toward the major without the permission of the DUS. Admission to senior-level seminars is at the instructor's discretion, but the Film and Media Studies program will ensure that every senior major gains admission to the required number of seminars.

The intensive major Students of substantial accomplishment and commitment to film and media studies are encouraged to pursue the intensive major. Students in the intensive major complete a senior project in production and also write a senior essay. The intensive major in Film and Media Studies is intended for students who are not pursuing two majors. Students must request approval from the Film and Media Studies Committee at the end of their junior year by submitting a proposal that outlines their objectives and general area of study.

Credit/D/Fail No more than one course taken Credit/D/Fail may be counted toward the major with permission of the DUS.

SENIOR REQUIREMENT

During the senior year, each student takes one or two senior-level seminars or the equivalent and submits a senior essay or senior project, which should represent a culmination of work in the major and in Yale College. The senior requirement

requires both critical writing and writing in images. Those undertaking creative senior projects should be expected to produce a paper of approximately fifteen pages in which the student discusses such questions as the genre to be used in the project, existing precedents for the topic, and his or her strategy in working on the project. Those undertaking to fulfill the senior requirement by writing a senior essay should additionally take a course in which they are expected to do, minimally, a small production assignment.

Majors graduating in December must submit their senior essays or senior projects to the DUS by Friday, December 6, 2019; those graduating in May, by Friday, April 24, 2020. A second reader assigned by the DUS participates in evaluating the essays and/or projects.

Preparation for a senior project Those students hoping to produce a film script or video as their senior project should make sure that they have taken enough courses in video production and screenwriting to be accepted into an advanced course in screenwriting or production. Senior creative projects in Film and Media Studies must be produced in conjunction with one such upper-level course. Students often start by completing FILM 161, 162 by the end of their sophomore year, and continue with FILM 355, 356 by the end of their junior year, to prepare for FILM 455, 456 or 483, 484 in their senior year. Those students interested in screenwriting often begin with FILM 350. Students interested in filmmaking should also take courses in screenwriting, and vice versa. Some production courses are available in the summer program in Prague.

Senior project Students who wish to complete a senior project as an alternative to an essay must petition the Film and Media Studies Committee for approval of their project at the end of the junior year. Projects might include writing a screenplay or producing a video. Students electing such an alternative should note that the project must be undertaken and accomplished over two terms. A limited number of students making films or videos are admitted to either the Advanced Fiction Film Workshop (FILM 483, 484) or the Documentary Film Workshop (FILM 455, 456), and receive three credits for their projects (two credits for FILM 483, 484 or 455, 456, and one for FILM 493 or 494). Such a choice effectively commits students to one extra course in addition to the twelve courses required for the major, because FILM 493 or 494 does not count toward the twelve required courses when taken in conjunction with FILM 483, 484 or 455, 456. Students may undertake a production project outside the workshops if (1) the Film and Media Studies Committee approves their petition, (2) they have found a primary adviser *qualified* and willing to provide the necessary supervision, and (3) they have identified the equipment necessary to execute the project. Such students may count FILM 493 and 494 toward the twelve courses required for the major.

Preparation for a senior essay Students in their senior year may prefer to write a senior essay rather than work on a creative project. To prepare, they should take advantage of the variety of courses in film history, media studies, and criticism and theory offered by the program, as well as such topics as American independent cinema, film theory, and African American cinema.

Senior essay For the student writing a senior essay, several options are possible. First, the student may enroll in two terms of relevant senior-level seminars (usually courses

numbered in the 400s) and write a substantial term paper of twenty-five pages, double-spaced, for one of these courses. Second, the student may do independent research on a yearlong senior essay (FILM 491, 492). This option is intended for students with clearly defined topics that do not relate closely to a senior-level seminar. During the first two weeks of the first term of senior year, a petition for permission to do independent research should be submitted to the DUS in the form of a brief prospectus, approved by the proposed faculty adviser to the essay. Such research receives two terms of credit; the product of a two-term research essay is a work of at least fifty pages. Third, the senior requirement may be completed by combining one single-term senior-level seminar with one term of an independent research project (FILM 491 or 492), resulting in a paper of thirty-five pages. Whichever option is chosen, the essay should be written on a topic informed by the student's previous course work at Yale College. In researching and writing the essay, the student should consult regularly with the seminar instructor, supplying preliminary drafts as appropriate, and may consult with other faculty members as well.

ADVISING

Foreign languages Study of relevant foreign languages is urged for all Film and Media Studies majors. Students considering graduate work should become proficient in French or another modern language. Those choosing to study film in relation to a foreign culture must have good listening and reading abilities in that language.

REQUIREMENTS OF THE MAJOR

Prerequisite FILM 150

Number of courses 12 term courses (incl prereq and senior req)

Specific courses required FILM 160 and FILM 320

Distribution of courses 1 upper-level national or world cinema course as specified; 1 production course; 1 critical studies course

Senior requirement *For senior essay*—2 terms of senior-level seminars, or 2 terms of senior essay (FILM 491, 492), or 1 term of each; *for senior project*—2 terms of senior project in FILM 455, 456, or 483, 484, and either FILM 493 or 494, for a total of 13 term courses; or 2 terms of senior project in FILM 493, 494 *with approved petition*

Intensive major Both senior project in production and senior essay

FACULTY ASSOCIATED WITH THE PROGRAM OF FILM AND MEDIA STUDIES

Professors *Dudley Andrew (*Comparative Literature, Film & Media Studies*), *Francesco Casetti (*Humanities, Film & Media Studies*), *Katerina Clark (*Comparative Literature, Slavic Languages & Literatures*), *Aaron Gerow (*East Asian Languages & Literatures, Film & Media Studies*), Inderpal Grewal (*Women's, Gender, & Sexuality Studies*), *John MacKay (*Film & Media Studies, Slavic Languages & Literatures*), *Millicent Marcus (*Italian*), Kobena Mercer (*History of Art, African American Studies*), *Charles Musser (*American Studies, Film & Media Studies*), *John Durham Peters (*English, Film & Media Studies*), *Brigitte Peucker (*German, Film & Media Studies*), *Katie Trumpener (*Comparative Literature, English*), Laura Wexler (*American Studies, Women's, Gender, & Sexuality Studies*)

Associate Professors Moira Fradinger (*Comparative Literature*), Zareena Grewal (*Ethnicity, Race, & Migration*), Brian Kane (*Music*), Brian Walsh (*English*), *R. John Williams (*English*)

Assistant Professors Marijeta Bozovic (*Slavic Languages & Literatures, Film & Media Studies, Women's Gender & Sexuality Studies*), Marta Figlerowicz (*Comparative Literature, English*)

Senior Lecturer Marc Lapadula (*Film & Media Studies*)

Lecturers Jonathan Andrews (*Art, Film & Media Studies*), James Charney (*School of Medicine*), Oksana Chefranova (*Film & Media Studies*), Thomas Allen Harris (*Film & Media Studies*), Michael Kerbel (*American Studies, Film & Media Studies*), Camille Thomasson (*Film & Media Studies*)

Critic Sandra Luckow (*Art*)

Senior Lectors Krystyna Illakowicz (*Slavic Languages & Literatures*), Karen von Kunes (*Slavic Languages & Literatures*)

*Member of the Film and Media Studies Advisory Committee.

Required Courses

FILM 150b, Introduction to Film Studies John MacKay

A survey of film studies concentrating on theory, analysis, and criticism. Students learn the critical and technical vocabulary of the subject and study important films in weekly screenings. Prerequisite for the major. WR, HU

FILM 160a / ENGL 196a, Introduction to Media Robert Williams

Introduction to the long history of media as understood in classical and foundational (and even more recent experimental) theories. Topics involve the technologies of modernity, reproduction, and commodity, as well as questions regarding knowledge, representation, public spheres, and spectatorship. Special attention given to philosophies of language, visuality, and the environment, including how digital culture continues to shape these realms. WR, HU

* **FILM 320a / HSAR 490a, Close Analysis of Film** Oksana Chefranova

The goal of this intensive seminar is to develop tools of close analysis of film as a significant art form by learning to identify elements of cinematic representation (*mise-en-scène*, cinematography, editing, sound, and the basic vocabulary associated with each aspect) and to demonstrate how these constituents combine to create meaning. Through developing a deeper understanding of a particular film, we transition from specific instances to broader considerations such as aesthetic and historical context or ideological critique. The course also traces the history of the close analysis method from structural semiotics and neoformalist analysis to digital humanities. We study films ranging from Hollywood and American filmmaking (Alfred Hitchcock and David Lynch) and European modernism (Robert Bresson and Jean-Luc Godard) to films that use expressive codes and cultural conventions less familiar to us (Lars von Trier and Hou Hsiao-hsien). Topics include genre, the digital image, landscape, body and face, gesture and screen performance, and cinematic atmosphere. Prerequisite: FILM 150.

HU

National Cinemas

* **FILM 243a / MGRK 218a / WGSS 245a, Family in Greek Literature and Film**

George Syrimis

The structure and multiple appropriations of the family unit, with a focus on the Greek tradition. The influence of aesthetic forms, including folk literature, short stories, novels, and film, and of political ideologies such as nationalism, Marxism, and totalitarianism. Issues related to gender, sibling rivalry, dowries and other economic factors, political allegories, feminism, and sexual and social violence both within and beyond the family. WR, HU TR

* **FILM 304a / EALL 281a, Japanese Cinema and Its Others** Aaron Gerow

Critical inquiry into the myth of a homogeneous Japan through analysis of how Japanese film and media historically represents "others" of different races, ethnicities, nationalities, genders, and sexualities, including blacks, ethnic Koreans, Okinawans, Ainu, undocumented immigrants, LGBT minorities, the disabled, youth, and monstrous others like ghosts. HU

* **FILM 319a / GMAN 273a / LITR 368a, The Third Reich in Postwar German Film, 1945-2007** Jan Hagens

Close study of the intersection of aesthetics and ethics with regard to how German films, since 1945, have dealt with Nazi history. Through the study of German-language films (with subtitles), produced in postwar East, West, and unified Germany through 2007, students consider and challenge perspectives on the Third Reich and postwar Germany, while learning basic categories of film studies. HU

* **FILM 363a / LITR 360a, Radical Cinemas of Latin America** Moira Fradinger

Introduction to Latin American cinema, with an emphasis on post-World War II films produced in Cuba, Argentina, Brazil, and Mexico. Examination of each film in its historical and aesthetic aspects, and in light of questions concerning national cinema and "third cinema." Examples from both pre-1945 and contemporary films. Conducted in English; knowledge of Spanish and Portuguese helpful but not required. HU

* **FILM 409a / LITR 306a / RSEE 327a / RUSS 327a, The Danube in Literature and Film** Marijeta Bozovic

The Danube River in the film, art, and literature of various Danubian cultural traditions, from the late nineteenth century to the present. Geography and history of the region that includes the river's shores and watershed; physical, historical, and metaphoric uses of the Danube; the region as a contested multilingual, multicultural, and multinational space, and as a quintessential site of cross-cultural engagement. Readings and discussion in English. WR, HU TR

* **FILM 412a / LITR 385, The Horror Film, 1960-1991** Brigitte Peucker

An examination of the horror film genre, primarily in American cinema. Psychosocial determinants; spectatorship, affect, and identification; the uncanny and the monstrous; the body; abjection. Films by Hitchcock, Romero, Friedkin, De Palma, Carpenter, Kubrick, Cronenberg, Demme, and others. HU

* **FILM 416b / FREN 394b / LITR 366b, French Cinema through the New Wave**

Dudley Andrew

The history of French cinema c. 1930 to 1970, from the onset of sound through the New Wave movement. The New Wave "idea of cinema"; the relation of cinema to national self-perception and state policy in France. HU RP

* **FILM 442b / LITR 403b / RUSS 403b, The City in Literature and Film** Katerina

Clark

Consideration of the architecture, town planning, and symbolic functions of various cities in Europe, Latin America, the United States, and East Asia. Discussion of the representation of these cities in literature and film. Works include older Soviet and Chinese films about Shanghai and contemporary films about Hong Kong and Beijing.

HU

* **FILM 461a / ENGL 384a / LITR 364a / THST 416a, British Cinema** Katie

Trumpener

Survey of the British film tradition, emphasizing overlap with literature, drama, and art; visual modernism; documentary's role in defining national identity; "heritage" filmmaking and alternative approaches to tradition; and auteur and actors' cinema. HU

RP

Film Theory, Visual Media, and Special Topics

FILM 232a, Classical Hollywood Narrative 1920–1960 Camille Thomasson

Survey of Classical Hollywood films. Topics include history of the studio system; origin and development of genres; the film classics of the Classical Hollywood period, and the producers, screenwriters, directors, and cinematographers who created them. WR, HU

* **FILM 235a / HUMS 218a, Storytelling and Contemporary TV** Staff

If Shakespeare were alive today, he would be writing for TV. So would Jane Austen. With the advent of cable, DVDs, the internet, and live streaming, TV—once considered a "vast wasteland"—has become the most dynamic and creative medium for storytelling, attracting talented writers, directors, and actors. This course explores the innovative narrative strategies that have transformed that wasteland into fertile terrain and ushered in a new Golden Age of TV. Careful visual and textual analysis of episodes is complemented by critical readings and comparisons to literature and cinema. We also consider technical and business pressures on the creative process behind today's "complex TV." The first part of the term focuses on the AMC series *Breaking Bad*.

The second part considers episodes from a range of shows in order to highlight the significance of title sequences, pilots, dialogue, subjective narration, jumbled chronology, and problematic endings. The third part examines the HBO series *The Young Pope*, which brings narrative and visual effects from cinema to the small screen.

HU

* **FILM 242a / ENGL 308a / HUMS 454a / LITR 398a, Interpreting Film Masterpieces**

David Bromwich and Dudley Andrew

Exploration of seven auteurs from Europe and Hollywood, 1937–1967. Assessment of methods that deepen appreciation of the films and the medium. WR, HU

* **FILM 305a / LITR 361a, Animation, Disney and Beyond** Aaron Gerow

Survey of the history and theory of animation. Examples from around the world, from various traditions, and from different periods. HU

FILM 306b / EALL 270b, Anime and the Posthuman Seth Jacobowitz

Japanese anime and its conceptions of the posthuman condition made possible by advances in science and technology. The persistence of myth, archetype, and humanist philosophy. HU

*** FILM 344b, Landscape, Film, Architecture** Staff

Movement through landscapes and cityscapes as a key to understanding them. Simulation of travel, using movie cameras and other visual-verbal means, as a way to expand historical, aesthetic, and sociological inquiries into how places are inhabited and experienced. Exploration of both real and imaginary places traversed in works by Edgar Allan Poe, Jules Verne, César Aira, Georges Rodenbach, Patrick Keiller, Georges Perec, and Andrei Tarkovsky. HU

*** FILM 411b / LITR 380b, The Films of Alfred Hitchcock** Brigitte Peucker

An examination of Hitchcock's career as a filmmaker from *Blackmail* to *Frenzy*, with close attention to the wide variety of critical and theoretical approaches to his work. Topics include the status of the image; the representation of the feminine and of the body; spectatorship; painterliness and theatricality; generic and psychoanalytic issues. HU

*** FILM 433a / AFAM 216a, Family Narratives/Cultural Shifts** Thomas Allen Harris

This course looks at films that are redefining ideas around family and family narratives in relation to larger social movements. We focus on personal films by filmmakers who consider themselves artists, activists, or agents of change but are united in their use of the nonfiction format to speak truth to power. In different ways, these films use media to build community and build family and ultimately, to build family albums and archives that future generations can use to build their own practices. Just as the family album seeks to unite people across time, space, and difference, the films and texts explored in this course are also journeys that culminate in linkages, helping us understand nuances of identity while illuminating personal relationships to larger cultural, social, and historical movements. HU

*** FILM 445b / LITR 450b, Film and Fiction in Interaction** Dudley Andrew

The dynamic exchange or relay between fiction and film, recognized by theorists just after WWII, while obvious in adaptations, also exists in the evolution of the styles and topics of both forms of cultural production. The French term "écriture," applied to films after 1948, is newly relevant in today's open cultural field where writers make films and where many adaptations begin as interpretations. Advanced course in literary or film studies. HU RP

Production Seminars

*** FILM 161b / ART 241b, Introductory Film Writing and Directing** Sandra Luckow

Problems and aesthetics of film studied in practice as well as in theory. In addition to exploring movement, image, montage, point of view, and narrative structure, students photograph and edit their own short videotapes. Emphasis on the writing and production of short dramatic scenes. Priority to majors in Art and in Film & Media Studies. Materials fee: \$150. Prerequisite for all majors: ART 142; additional prerequisite for Film & Media Studies majors: FILM 150. RP

* **FILM 162a / ART 142a, Introductory Documentary Filmmaking** Sandra Luckow
The art and craft of documentary filmmaking. Basic technological and creative tools for capturing and editing moving images. The processes of research, planning, interviewing, writing, and gathering of visual elements to tell a compelling story with integrity and responsibility toward the subject. The creation of nonfiction narratives. Issues include creative discipline, ethical questions, space, the recreation of time, and how to represent "the truth." Materials fee: \$150. RP

* **FILM 330b, The Screenwriter's Craft** Camille Thomasson
A rigorous writer's workshop. Students conjure, write, rewrite, and study films. Read screenplays, view movie clips, parse films, and develop characters and a scenario for a feature length screenplay. By the end of term, each student will have created a story outline and written a minimum of fifteen pages of an original script. All majors welcome.

* **FILM 350a or b, Screenwriting** Marc Lapadula
A beginning course in screenplay writing. Foundations of the craft introduced through the reading of professional scripts and the analysis of classic films. A series of classroom exercises culminates in intensive scene work. Prerequisite: FILM 150. Not open to freshmen.

FILM 355b / ART 341b, Intermediate Film Writing and Directing Jonathan Andrews
In the first half of the term, students write three-scene short films and learn the tools and techniques of staging, lighting, and capturing and editing the dramatic scene. In the second half of the term, students work collaboratively to produce their films. Focus on using the tools of cinema to tell meaningful dramatic stories. Materials fee: \$150. Enrollment limited to 8. Priority to majors in Art and in Film & Media Studies. Prerequisites: ART 241. RP

FILM 356a / ART 342a, Intermediate Documentary Filmmaking Sandra Luckow
Students explore the storytelling potential of the film medium by making documentary art. The class concentrates on finding and capturing intriguing, complex scenarios in the world and then adapting them to the film form. Questions of truth, objectivity, style, and the filmmaker's ethics are considered using examples of students' work. Exercises in storytelling principles. Materials fee: \$150. Limited enrollment. Priority to majors in Art and in Film & Media Studies. Prerequisites: ART 141 or 142, and FILM 150. HU RP

* **FILM 395b, Intermediate Screenwriting** Marc Lapadula
A workshop in writing short screenplays. Frequent revisions of each student's script focus on uniting narrative, well-delineated characters, dramatic action, tone, and dialogue into a polished final screenplay. Prerequisite: FILM 350. Priority to majors in Film & Media Studies.

* **FILM 434b / AFAM 220b, Archive Aesthetics and Community Storytelling** Thomas Allen Harris
This production course explores strategies of archive aesthetics and community storytelling in film and media. It allows students to create projects that draw from archives – including news sources, personal narratives, and found archives – to produce collaborative community storytelling. Conducted as a production workshop, the course explores the use of archives in constructing real and fictive narratives across a variety of disciplines, such as – participants create and develop autobiographies, biographies,

or fiction-based projects, tailored to their own work in film/new media around Natalie Goldberg's concept that "our lives are at once ordinary and mythical." HU

*** FILM 455a and FILM 456b / AMST 463a and AMST 464b / EVST 463a and EVST 464b, Documentary Film Workshop** Charles Musser

A yearlong workshop designed primarily for majors in Film and Media Studies or American Studies who are making documentaries as senior projects. Seniors in other majors admitted as space permits. RP

*** FILM 483a and FILM 484b / ART 442a and ART 443b, Advanced Film Writing and Directing** Jonathan Andrews

A yearlong workshop designed primarily for majors in Art and in Film & Media Studies making senior projects. Each student writes and directs a short fiction film. The first term focuses on the screenplay, production schedule, storyboards, casting, budget, and locations. In the second term students rehearse, shoot, edit, and screen the film. Materials fee: \$150. Enrollment limited to 8. Priority to majors in Art and in Film & Media Studies. Prerequisite: ART 341.

*** FILM 487a and FILM 488b, Advanced Screenwriting** Marc Lapadula

Students write a feature-length screenplay. Emphasis on multiple drafts and revision. Admission in the fall term based on acceptance of a complete step-sheet outline for the story to be written during the coming year. Primarily for Film & Media Studies majors working on senior projects. Prerequisite: FILM 395 or permission of instructor.

Individual Research and Senior Essay Course or Project

*** FILM 471a or b, Independent Directed Study** Staff

For students who wish to explore an aspect of film and media studies not covered by existing courses. The course may be used for research or directed readings and should include one lengthy essay or several short ones as well as regular meetings with the adviser. To apply, students should present a prospectus, a bibliography for the work proposed, and a letter of support from the adviser to the director of undergraduate studies. Term credit for independent research or reading may be granted and applied to any of the requisite areas upon application and approval by the director of undergraduate studies.

*** FILM 491a and FILM 492b, The Senior Essay** Staff

An independent writing and research project. A prospectus signed by the student's adviser must be submitted to the director of undergraduate studies by the end of the second week of the term in which the essay project is to commence. A rough draft must be submitted to the adviser and the director of undergraduate studies approximately one month before the final draft is due. Essays are normally thirty-five pages long (one term) or fifty pages (two terms).

*** FILM 493a and FILM 494b, The Senior Project** Staff

For students making a film or video, either fiction or nonfiction, as their senior project. Senior projects require the approval of the Film and Media Studies Committee and are based on proposals submitted at the end of the junior year. An interim project review takes place at the end of the fall term, and permission to complete the senior project can be withdrawn if satisfactory progress has not been made. For guidelines, consult the director of undergraduate studies. Does not count toward the fourteen courses required for the major when taken in conjunction with FILM 455, 456 or FILM 483, 484.

First-Year Seminar Program

The First-Year Seminar program offers a diverse array of courses open only to first-year students and designed with first-year students in mind. Enrollment in seminars is limited to fifteen or eighteen students, depending on the nature of the course. Most seminars meet twice each week and do not, unless otherwise noted, presume any prior experience in the field. Students must apply and preregister for first-year seminars before the beginning of each term. To ensure that all applicants share an equal chance at enrolling in a seminar, students are admitted by lottery from among those who apply. Students who do not preregister may be considered for placement at the instructor's discretion if space is available. Information regarding application procedures may be found on the program website.

Courses

* **ANTH 011a, Reproductive Technologies** Marcia Inhorn

Introduction to scholarship on the anthropology of reproduction. Focus on reproductive technologies such as contraceptives, prenatal diagnostics, childbirth technologies, abortion, assisted reproduction, surrogacy, and embryonic stem cells. The globalization of reproductive technologies, including social, cultural, legal, and ethical responses. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SO

* **APHY 050a / PHYS 050a, Science of Modern Technology and Public Policy** Daniel Prober

Examination of the science behind selected advances in modern technology and implications for public policy, with focus on the scientific and contextual basis of each advance. Topics are developed by the participants with the instructor and with guest lecturers, and may include nanotechnology, quantum computation and cryptography, renewable energy technologies, optical systems for communication and medical diagnostics, transistors, satellite imaging and global positioning systems, large-scale immunization, and DNA made to order. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SC RP

* **ARCH 006a, Architectures of Urbanism: Thinking, Seeing, Writing the City** Michael Schlabs

What is architecture, and how is it conceived, relative to notions of the urban – to the broader, deeper, messier web of ideas, forms, and fantasies constituting “the city?” Can architecture play a role in defining the city, as such, or does the city’s political and social construction place it outside the scope of specifically architectural concerns? Likewise, what role can the city play in establishing, interrogating, and extrapolating the limits of architecture, whether as a practice, a discourse, or a physical manifestation of human endeavor in the material environment? This course addresses these and other related questions, seeking to position architecture in its broader urban, social, cultural, political, intellectual, and aesthetic contexts. In so doing, it assumes the position that the nature and character of the urban can largely be characterized in terms of the manner in which we, as a society, conceive, construct, and contribute to notions of “the public,” or “the common.” Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. Prerequisite: general knowledge of 20th-century history. HU

* **ART 004a, Words and Pictures** Halsey Rodman

Introduction to visual narration, the combination of words and pictures to tell a story. Narrative point of view, counternarrative and counterculture, visual satire, personal history, depictions of space and time, and strategies and politics of representation. Sources include illuminated manuscripts, biblical paintings, picture-stories, comic strips, and graphic novels. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU RP

* **ART 006a, Art of the Printed Word** Richard Rose

Introduction to the art and historical development of letterpress printing and to the evolution of private presses. Survey of hand printing; practical study of press operations using antique platen presses and the cylinder proof press. Material qualities of printed matter, connections between content and typographic form, and word/image relationships. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

* **ART 007b, Art of the Game** Sarah Stevens-Morling

Introduction to interactive narrative through video game programming, computer animation, and virtual filmmaking. Topics include interactive storytelling, video game development and modification, animation, and virtual film production. Students produce a variety of works including web-based interactive narratives, collaboratively built video games, and short game-animated film production (machinima). Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program.

* **ART 012b, On Activism: The Visual Representation of Protest and Disruption**

Pamela Hovland

An introduction to the visual representations of protest, struggle, and revolution in this country from the Vietnam War to the present moment. The course explores a range of historically significant social and political movements, visual (communication) and dissemination strategies, and working methods. The primary goal of this studio-based course is to investigate and expand the designer/artist's ability to express a point of view, transform contemporary understanding of local and national issues through a series of exercises, iterative making and experiments in distribution methods via solo and collaborative work. The students' practice is supported by close readings, independent research, case studies, field trips, and presentations from a diverse collection of people directly involved in activism. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

* **ART 013a, Temperamental Spaces** Markus Schinwald

Spaces can sometimes appear as idiosyncratic as the people within them, taking on characteristics we usually ascribe to ourselves. They can appear erratic, comforting, uncanny—even threatening. Working like a therapy session for architecture, the body, and the objects around us, this seminar analyzes a diverse collection of readings and works, ranging from Renaissance mysticism to conceptual art and film, to explore how the visual arts have utilized a productive, but skeptical, relationship with space. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

* **ART 014b, Research in the Making** Karin Schneider

Artistic research expands the research form to focus on haptic and tactile study of physical and historical objects. Through field trips to various special collections and libraries, including the Beinecke, the Yale Art Gallery, and the Map Collection, students respond to specific objects in the vast resources of Yale University. Group discussions, lectures, and critiques throughout the term help foster individual projects. Each student conducts research through the artistic mediums of drawing, photography, video, and audio, to slowly build an interconnected collection of research that is also an artwork. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

* **ASTR 040a / PHYS 040a, Expanding Ideas of Time and Space** C. Megan Urry

Discussions on the nature of time and space. Topics include the shape and contents of the universe, special and general relativity, dark and light matter, and dark energy. Observations and ideas fundamental to astronomers' current model of an expanding and accelerating four-dimensional universe. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SC

* **CLCV 034a / HIST 037a / HSHM 002a, Medicine and Disease in the Ancient World**

Jessica Lamont

Examination of ancient medicine considering modern fields of pathology, surgery, pharmacology, therapy, obstetrics, psychology, anatomy, medical science, ethics, and education, to gain a better understanding of the foundations of Western medicine and an appreciation for how medical terms, theories, and practices take on different meanings with changes in science and society. All readings in English. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.

HU

* **CPSC 035b / MUSI 035b, Twenty-First Century Electronic and Computer Music Techniques** Scott Petersen

Exploration of twenty-first century electronic and computer music through the diverse subjects and issues at the intersection of technology and new music. How computers have changed and challenged the analysis, composition, production, and appreciation of music over the last fifty years. Knowledge of basic music theory and the ability to read Western musical notation is assumed. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program.

* **ENGL 010a, Jane Austen** Stefanie Markovits

Close study of Austen's novels, with special attention to the critique of social and literary convention. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

* **ENGL 023b / HUMS 072b, Reading Recent North American Short Fiction** Joseph Gordon

The short story is generally considered to be North American in origin. As one of its goals, the course examines the ways in which the genre has developed in recent decades into a vehicle for storytelling from marginalized or subaltern voices such as those of people of color, women, LGBT people, immigrants and refugees, war veterans, students, and children. The course also explores how collections of stories gathered by a single author may resemble but yet be distinguishable from novels, and examines some very recent short stories that are influenced by nontraditional forms of writing, such as

graphic fiction, self-help manuals, and social media. Authors are likely to include: Grace Paley, Alice Munro, Margaret Atwood, Raymond Carver, Lucia Berlin, Sherman Alexie, Tao Lin, Lydia David, Jhumpa Lahiri, Edward P. Jones, Elizabeth Strout, Junot Diaz, Phil Klay, Viet Thanh Nguyen, Alison Bechdel, Nathan Englander, Kristen Rupenian, Jennifer Egan, and Teju Cole. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

* **ENGL 025a / LITR 023a / SAST 059a, Modern South Asian Literature, 1857-2017**

Priyasha Mukhopadhyay

Exploration of literary texts from South Asia, 1857 to the present. Close reading of literary texts from India, Pakistan, Bangladesh, and Sri Lanka, alongside political speeches, autobiographies, and oral narratives. Topics include colonialism, history writing, migration, language, caste, gender and desire, translation, politics and the novel. Enrollment limited to first-year students. Preregistration is required; see under First-Year Seminar Program. WR, HU

* **EVST 007a, The New England Forest** Marlyse Duguid

Exploration of the natural history of southern New England, with specific focus on areas in and around New Haven. Pertinent environmental issues, such as climate change, endangered species, and the role of glacial and human history in shaping vegetative patterns and processes, are approached from a multi-disciplinary framework and within the context of the surrounding landscape. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.

* **EVST 020a / F&ES 020a, Sustainable Development in Haiti** Gordon Geballe

The principles and practice of sustainable development explored in the context of Haiti's rich history and culture, as well as its current environmental and economic impoverishment. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR

* **EVST 040a, Collections of the Peabody Museum** David Skelly

Exploration of scientific questions through the study and analysis of objects within the Peabody Museum's collections. Formulating a research question and carrying out a project that addresses it are the core activities of the course. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SC

* **FREN 096b, Women's Narratives of Self in Modern French Literature** Maryam Sanjabi

The course explores women's autobiographical literature, demonstrating their uniqueness from an individual perspective and capturing the social, economic, religious, and ethnic themes of the period and their authors' intellectual standpoints. The selected books represent a variety of literary genres ranging from memoir to journal, graphic novel, and film scripts with a focus on the 20th and 21st centuries as they appear in the works of: Colette, Simone de Beauvoir, Nathalie Sarraute, Lucie Aubrac, Hélène Berr, Assia Djebar, Ken Bugul, Agnès Varda, Marjane Satrapi, Marguerite Duras, Annie Ernaux, and Camille Laurens among others. This course thus aims at a critical awareness of what modernity has meant in women's experiences and why debate about its consequences often revolves around women's lives. While some authors explore the coming of age of European gender awareness, others deal with the war and resistance and more recent non-Western voices in French pose the question of identity of the "Other." Course readings include short theoretical essays and

a number of secondary works. Conducted in French and English. Papers in French or in English. Readings in French. There is no prerequisite, but students who took FREN 170 or an equivalent will feel comfortable. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

* **G&G 010a, Earth, Resources, Energy, and the Environment** Mary-Louise Timmermans

A first-year science seminar devoted to the understanding of humankind's interactions with, and place within, the natural world. Topics include: Earth's history and early life, evolution and mass extinction, human population growth, industrialization, fossil fuels, pollution, the carbon cycle and global warming, and a planetary perspective on the Earth. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SC

* **HIST 006b / HSHM 005b, Medicine and Society in American History** Rebecca Tannenbaum

Disease and healing in American history from colonial times to the present. The changing role of the physician, alternative healers and therapies, and the social impact of epidemics from smallpox to AIDS. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **HIST 012b / AMST 012b, Politics and Society in the United States after World War II** Jennifer Klein

Introduction to American political and social issues from the 1940s to the present, including political economy, civil rights, class politics, and gender roles. Legacies of the New Deal as they played out after World War II; the origins, agenda, and ramifications of the Cold War; postwar suburbanization and its racial dimensions; migration and immigration; cultural changes; social movements of the Right and Left; Reaganism and its legacies; the United States and the global economy. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU

* **HIST 020b / ARCG 031b / CLCV 059b / EVST 030b / NELC 026b, Rivers and Civilization** Harvey Weiss

The appearance of the earliest cities along the Nile and Euphrates in the fourth millennium B.C. Settlements along the rivers, the origins of agriculture, the production and extraction of agricultural surpluses, and the generation of class structures and political hierarchies. How and why these processes occurred along the banks of these rivers; consequent societal collapses and their relation to abrupt climate changes. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU, SO

* **HIST 022a, What History Teaches** John Gaddis

An introduction to the discipline of history. History viewed as an art, a science, and something in between; differences between fact, interpretation, and consensus; history as a predictor of future events. Focus on issues such as the interdependence of variables, causation and verification, the role of individuals, and to what extent historical inquiry can or should be a moral enterprise. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

* **HIST 033a / WGSS 033a, Fashion in London and Paris, 1750 to the Present** Becky Conekin

Introduction to the history of Western fashion from the mid-eighteenth century to the present, with a focus on Paris and London. Approaches, methods, and theories scholars have historically employed to study fashion and dress. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

* **HIST 034b, Cuba from Slavery to Revolution** Anne Eller

Cuba's rich history from the early colonial period to the present. Topics include colonialism, slavery, independence, emancipation, the Cuban Revolution, and the nation's relationship with the United States. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **HIST 055b, A History of Modern London** Becky Conekin

Chronological and thematic exploration of modern London as a metropolitan and imperial center from the late-nineteenth-century to the present day. Topics include race, gay rights, women's rights, consumer culture, the experience of war, and the development of a multi-racial society. The fashion, food, and popular music of London emerge as important components of the city's global identity in the twentieth century. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

* **HIST 072a, The History of World History** Valerie Hansen

How the great historians of ancient Greece, Rome, China, the Islamic world, and nineteenth-century Europe created modern historical method. How to evaluate the reliability of sources, both primary and secondary, and assess the relationship between fact and interpretation. Using historical method to make sense of our world today. Strategies for improving reading, writing, and public speaking skills. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

* **HLTH 081a, Current Issues in Medicine and Public Health** Robert Bazell

Analysis of issues in public health and medicine that get extensive media attention and provoke policy debates. Topics include vaccination, the value of cancer screening and genetic testing, determinants of a healthy lifestyle, the U.S. role in global health, and the cost of health care. Enrollment limited to freshmen with a score of 4 or 5 on the Advanced Placement examination in Biology or the equivalent. Preregistration required; see under Freshman Seminar Program.

* **HSAR 002a / AMST 007a, Furniture and American Life** Edward Cooke

In-depth study and interpretation of American furniture from the past four centuries. Hands-on experience with furniture in the collection of the Yale University Art Gallery to explore such topics as materials, techniques, styles, use, and meaning. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU RP

* **HSAR 015a / SAST 060a, Ten Indian Objects** Subhashini Kaligotla

A 5000-year-old stone seal, a 20th century comic book, an emperor's painted portrait, a processional bronze god, a miniature temple, an inscribed pillar, a rock crystal reliquary, a serene Buddha, an animated film, and a towering female figure. Through rigorous explorations of these ten objects from South Asia this seminar teaches close looking, vivid writing, and narrating history through things. It considers both the biographies

of the objects and their involvement in the wider social, political, artistic, and cultural histories of the Indian subcontinent. Students engage some of the most exciting scholarship in the field of South Asian art, and observe, draw, and write about things in museums and art collections on a weekly basis. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

* **HUMS 071a, Intellectual Circles** Charles Hill

Study of the creative interactions produced by informal associations of innovative minds in literature, philosophy, politics, science, psychology, the arts, war, and law. Courtiers, advisors, disciples, and disputers around Confucius, Socrates, Lincoln, Freud, Wittgenstein, and Niebuhr are among the circles considered. Groups include American Founders, quantum physicists, computer scientists, Gertrude Stein's "Lost Generation" of Americans in Paris, "The Georgetown Set" of Cold War friends and rivals, and the Supreme Court. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

* **HUMS 075a, Mastering the Art of Watercolor** Adam Van Doren

An introductory course on the art of watercolor as a humanistic discipline within the liberal arts tradition. Readings, discussions, and studio work emphasize critical, creative thinking through a tactile, "learning by doing" study of the watercolor medium. Students analyze and imitate the classic techniques of J. M.W. Turner, John Singer Sargent, Georgia O'Keeffe, and Edward Hopper, among others. Studio components include painting *en plein air* to understand color, form, perspective, composition, and shade and shadow. Basic drawing skills recommended. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU RP

* **MB&B 050b, Topics in Cancer Biology** Sandy Chang

Introduction to cancer as a genetic disease, with a focus on major discoveries in cancer biology that offer mechanistic insights into the disease process. A brief history of cancer; influence of the genomic revolution on cancer diagnostics; molecular defects underlying specific cancers; current and future cancer therapeutics. Patient case studies highlight specific molecular pathways and treatment strategies. Enrollment limited to first-year students with a strong background in biology and/or chemistry, typically demonstrated by a score of 5 on Advanced Placement examinations. Preregistration required; see under First-Year Seminar Program. WR, SC

* **MB&B 060a, Molecular Medicine** Sandy Chang

The main purpose of this course is to use benign and malignant hematological disorders to introduce fundamental concepts in molecular and cellular biology. Students emerge from this course with a firm understanding of the molecular pathways perturbed in various hematological disorders and the therapeutics currently used to exploit these pathways for disease treatment. Through lectures and reading of primary scientific literature, students learn about landmark discoveries in hematology and how these discoveries contribute to understanding of the normal hematopoietic system, and when perturbed, how diseases arise. Students also learn to (1) read primary scientific literature, (2) synthesize this material to present to the class and (3) learn how to write a short grant proposal. These skills are essential for any successful scientist or physician, and it's important to master them early. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. Prerequisite: score of 5 on the AP Biology exam or AP Chemistry exam. WR, SC

* **MCDB 040b, The Science and Politics of Cancer** Robert Bazell

Fundamentals of cell biology, Darwinian evolution, immunology, and genetics that underlie cancer; the history of cancer science and treatment; historical and current policy issues. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SC

* **MCDB 050a, Immunology and Microbes** Paula Kavathas

Introduction to the immune system and its interaction with specific microbes. Attention both to microbes that cause illness, such as influenza, HIV, and HPV, and to microbes that live in harmony with humans, collectively called the microbiome. Readings include novels and historical works on diseases such as polio and AIDS. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program.

SC RP

* **MCDB 065a, The Science and Politics of HIV/AIDS** Robert Bazell

Study of the basic virology and immunology of HIV/AIDS, along with its extraordinary historical and social effects. Issues include the threat of new epidemics emerging from a changing global environment; the potential harm of conspiracy theories based on false science; and how stigmas associated with poverty, gender inequality, sexual preference, and race facilitate an ongoing epidemic. For all first-year students regardless of whether they are considering a science major. Prerequisite: AP Biology or equivalent. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SC

* **NELC 001b / AFST 001b / ARCG 001b, Egypt and Northeast Africa: A Multidisciplinary Approach** John Darnell

An introduction to Egyptology, examining approximately 10,000 years of Nile Valley cultural records and 3,000 years of Egyptian history. The course presents an overview of the historical and archaeological study of Egypt and her southern neighbor Nubia. Various original written and visual sources are used, including the collections of the Peabody Museum and the Yale Art Gallery, with some material accessible in the classroom. Students gain a basic understanding of the hieroglyphic script and the Ancient Egyptian language, and are able to read some inscriptions in museum visits at the end of the course. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

* **PHIL 091a, Philosophy of Games** Mark Maxwell

In this class, we critically discuss a variety of puzzles that arise when thinking about games. Just what are games, anyway? And, how can thinking in terms of games help us understand the world? The notion of 'game' is a topic of interest in its own right, but games can also serve as a model and metaphor for other parts of the world, including life as a whole and the exploration of other philosophical debates. As such, the study of games serves as an entry point to a number of topics of potential interest, rather than just an in-depth study of one topic. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

* **PHYS 040a / ASTR 040a, Expanding Ideas of Time and Space** C. Megan Urry

Discussions on the nature of time and space. Topics include the shape and contents of the universe, special and general relativity, dark and light matter, and dark energy. Observations and ideas fundamental to astronomers' current model of an expanding

and accelerating four-dimensional universe. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SC

* **PLSC 028a, American Constitutionalism: Power and its Limits** Gordon Silverstein
What happens when a modern superpower tries to govern itself under an 18th Century Constitution? Using original documents, contemporaneous books, and U.S. Supreme Court cases, this course explores the debates that have defined America's struggle to live up to its sometimes conflicting commitments to liberty, equality and the consent of the governed. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SO

* **RLST 015a / SAST 057a, Gods and Heroes in Indian Religions** Phyllis Granoff
The basic doctrines and practices of India's three classical religions, Buddhism, Jainism, and Hinduism, explored through close reading of texts in translation. Lives of the founders, great monks, nuns, and lay followers of Buddhism and Jainism; myths of the major Hindu gods; heroines and goddesses in the three traditions. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program.

HU

* **RLST 018a / SAST 058a, Yoga in South Asia and Beyond** Supriya Gandhi
The history of yoga practice and thought from the earliest textual discussions of yoga until the present day. Topics include the body, cosmology, cross-cultural interactions, colonialism, and orientalism. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU

* **SCIE 030a and SCIE 031b, Current Topics in Science** Douglas Kankel
A series of modules in lecture and discussion format addressing scientific issues arising in current affairs. Topics are selected for their scientific interest and contemporary relevance, and may include global warming, human cloning, and the existence of extrasolar planets. Credit for SCIE 030 upon completion of SCIE 031; one course credit is awarded for successful completion of the year's work. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SC
½ Course cr per term

* **SPAN 060a, First-Year Colloquium: Literary Studies in Spanish** Leslie Harkema
Introduction to the study of literature in general and to some of the most important texts in Hispanic literature. Selected texts in Spanish include short stories, essays, lyric, and theater. Open to students who have placed into L5 courses. Counts toward the requirements of the Spanish major with permission of the director of undergraduate studies. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. L5, HU

* **THST 097b, Anatomy in Motion** Bronwen MacArthur
The connection between advances in human anatomy and kinesiology – the science of human movement – and dance practices from the early 1900s to the present. Study of seminal texts and practical exercises that drove the research of Frederick M. Alexander, Mabel Elsworth Todd, Barbara Clark, and Lulu Sweigard and the application of their ideas in contemporary movement practices today. Topics include the synthesis of dance and science; the reeducation of alignment, posture and balance; the use of imagery; and the unification of mind and body. No prior dance experience required. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.

HU

* **THST 098a, Composing and Performing the One Person Play** Hal Brooks

First-year actors, playwrights, directors, and even students who have never considered taking a theater class, create their own work through a combination of reading, analysis, writing, and on-your-feet exercises. Students read texts and view performances that are generated by one actor in an attempt to discover the methodology that works best for their own creations. The course culminates with a midterm and final presentation created and performed by the student. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.

* **WGSS 030a, Neoliberalism and Sexuality** Evren Savci

Sexuality is often imagined as a private and intimate affair, experienced individually, marked by personal histories and preferences. This course argues otherwise. Specifically, we consider the intersections between the current dominant political economic mode, referred to as neoliberal capitalism, and sexuality as a field of power. We analyze how subjectivities are formed under this current system, how desires are produced and discourses incited, and how the particular *moralization* of economic behavior has implications for a range of issues including reproductive justice, definitions of kinship, sexual liberation movements, and contemporary states of war and emergency. Thinking of sexuality as a field of power that is predicated on notions of normality and abnormality enables us to see what other “undesirable” subjects are produced under conditions of neoliberal capitalist modernity with whom sexual others are always in kinship. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SO

Forestry and Environmental Studies

Program adviser: John Wargo (john.wargo@yale.edu), 124 KRN, 432-5123

The School of Forestry & Environmental Studies is primarily a graduate and professional program designed to train leaders to solve worldwide environmental problems and to provide new understanding of local and global environments through interdisciplinary research in the natural and social sciences. The School offers numerous courses to undergraduates in Environmental Studies, and undergraduates from any major can take courses in the School. Those undergraduates with significant interest should contact the School's undergraduate program adviser to discuss a joint degree program that allows Yale College students to earn both a bachelor's degree from Yale College and an M.E.M. from the School of Forestry & Environmental Studies in five years. For more information on the joint program, see the School's website. Most graduate-level courses are open to qualified undergraduates. Listings and detailed descriptions of these courses are available in the bulletin of the School of Forestry & Environmental Studies, and most also appear in the online bulletin of the Graduate School of Arts and Sciences. Information about the programs of the School of Forestry & Environmental Studies may be found on the School's website. Most lectures and symposia are open to undergraduates, and a calendar of events is also posted on the School's website.

* **F&ES 020a / EVST 020a, Sustainable Development in Haiti** Gordon Geballe
The principles and practice of sustainable development explored in the context of Haiti's rich history and culture, as well as its current environmental and economic impoverishment. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR

* **F&ES 261a / EVST 261a / G&G 261a, Minerals and Human Health** Ruth Blake
Study of the interrelationships between Earth materials and processes and personal and public health. The transposition from the environment of the chemical elements essential for life. After one year of college-level chemistry or with permission of instructor; G&G 110 recommended. SC

* **F&ES 290b / EVST 290b, Geographic Information Systems** Charles Tomlin
A practical introduction to the nature and use of geographic information systems (GIS) in environmental science and management. Applied techniques for the acquisition, creation, storage, management, visualization, animation, transformation, analysis, and synthesis of cartographic data in digital form.

F&ES 315a / E&EB 115a, Conservation Biology Linda Puth
An introduction to ecological and evolutionary principles underpinning efforts to conserve Earth's biodiversity. Efforts to halt the rapid increase in disappearance of both plants and animals. Discussion of sociological and economic issues. SC

French

Director of undergraduate studies: Morgane Cadieu (morgane.cadieu@yale.edu), Rm. 320, 82–90 Wall St., 436-2886; language program director: Ruth Koizim (ruth.koizim@yale.edu), Rm. 319, 82–90 Wall St., 432-4904; french.yale.edu

The Department of French has two distinct but complementary missions: to provide instruction in the French language at all levels of competence, and to lead students to a broad appreciation and deep understanding of the literatures and cultures of France and other French-speaking countries.

The major in French is a liberal arts major, designed for those who wish to study one of the world's richest cultures in depth. The department offers courses devoted to authors, works, and literary and cultural movements that span ten centuries and four continents. The curriculum also includes interdisciplinary courses on relations between literature and other areas of study such as history, law, religion, politics, and the arts. Majors are encouraged to explore all periods and genres of literature in French, as well as a wide variety of critical approaches.

Excellent knowledge of a foreign language and a mature, informed appreciation of a foreign literature open doors to many professions. The French major provides ideal preparation for careers in a wide range of fields from law and diplomacy to journalism, academia, and the arts. Recent graduates have gone on to selective law schools and graduate programs in French and comparative literature. Others work in business, government, primary and secondary education, and a variety of nongovernmental agencies and international organizations.

French can be taken either as a primary major or as one of two majors, in consultation with the director of undergraduate studies (DUS). Appropriate majors to combine with French might include, but are not limited to, African American Studies, African Studies, English, Film and Media Studies, Global Affairs, History, History of Art, Humanities, Literature, Music, Philosophy, Political Science, Theater Studies, and Women's, Gender, and Sexuality Studies. Regulations concerning the completion of two majors can be found in the Academic Regulations, section K, Special Arrangements.

COURSE NUMBERING

Group A courses (FREN 110–159) This group consists of language courses that lead directly to courses counting toward the major. Preregistration is required for all Group A courses except FREN 125 and 145. FREN 121 (the stand-alone L2) is only offered during the fall term. For this reason, students placed into L1 or L2 who were not enrolled in a fall-term course will have to wait until the next fall to enroll. For further details, students should consult Ruth Koizim (ruth.koizim@yale.edu), the language program director. (ruth.koizim@yale.edu)

Group B courses (FREN 160–449, not including Group C courses) This group contains more advanced courses that are taught in French and count toward the major. FREN 160 and 170 are gateway courses that prepare students for courses numbered FREN 200 and above. Courses in the FREN 180–199 range are advanced language courses. Courses numbered 200–449 are advanced courses in literature and culture. The 200–299 range contains courses devoted to broad, general fields defined

by century or genre; the 300–449 range contains courses devoted to specific topics within or across those general fields.

Group C courses This group comprises courses taught in English; readings may be in French or English. Two term courses from this group may be counted for credit toward the major.

PREREQUISITES

Candidates for the major should take FREN 150 or the equivalent during the first or second year. Prospective majors are strongly encouraged to take at least one literature course numbered 170 or above before the end of the sophomore year.

PLACEMENT PROCEDURES

The departmental placement exam in French is accessible online over the summer. Dates and information for the exam will be available on the French department website, in the *Calendar for the Opening Days of College*, and on the Center for Language Study website.

All students who have not yet studied French at Yale (except those who have had no previous exposure to French whatsoever) are expected to take the departmental placement exam. Students who studied abroad over the summer with non-Yale programs must take the placement exam to be eligible to receive credit for their work.

Students who earned superior scores on standardized tests may be able to enroll in a course designated L5. The department strongly recommends, however, that advanced students of French take the departmental placement exam in order to be directed to the most appropriate courses. Students who earned a score of 5 on the Advanced Placement exam, a score of 6 or 7 on the advanced-level International Baccalaureate (IB) exam, a rating of C1 on the CEFR European test, or an A or B on the GCE A-level exam are normally placed into a course at the 150 level and above.

Students who wish to begin taking French in the spring are advised to take the placement exam over the summer. Placement exam results remain valid for one year.

REQUIREMENTS OF THE MAJOR

The major for the Class of 2020 With DUS approval, the following changes, through the addition of a translation track, to the requirements of the major may be fulfilled by students who declared their major under previous requirements.

The major for the Class of 2021 and subsequent classes Requirements of the major are described below.

The standard major The standard major consists of ten term courses numbered 160 or above, including a one-term senior essay (see below). One of these ten courses must be FREN 170 or the equivalent, which should be completed early in a candidate's studies; at least four must be Group B courses numbered 200 or above. Students may count no more than two courses in the FREN 180–199 range and no more than two courses conducted in English (Group C) toward the major. With prior approval of the DUS, a maximum of four term courses taught outside the Yale Department of French but bearing directly on the student's principal interest may be counted toward the major. Up to two of these may be taken in other departments at Yale, and up to four may be taken as part of a Year or Term Abroad or summer study abroad program. However, the

combined number of courses from other departments and from study abroad may not exceed four. (The DUS may grant exceptions to this limit for students who spend two academic terms in an approved study abroad program.) Relevant first-year seminars may count toward the major, with permission of the DUS.

Translation track Students may elect to pursue the translation track within the French major. Translation track majors are expected to take a minimum of two courses in French translation as two of the ten credits required for the standard major, or twelve credits required for the intensive major. Within the department, this requirement can be fulfilled by taking FREN 191 and FREN 192. Students who opt for the translation track may take up to four courses numbered 180-199, rather than the standard two courses.

The intensive major The intensive major is designed for students who wish to undertake a more concentrated study of literature in French. It is recommended for students considering graduate study in French or in comparative literature. The intensive major consists of twelve term courses numbered 160 or above, including a one-term or two-term senior essay (see below). At least five courses must be from Group B and numbered 200 or above. The requirement of FREN 170 and the stipulations for courses in the 180-199 range, courses conducted in English, and courses taken outside the department are identical to those for the standard major.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

SENIOR REQUIREMENT

All majors must write a senior essay showing evidence of careful reading and research and substantial independent thought. Essays may be written in either French or English and must be prepared under the direction of a ladder faculty member in the Department of French. Students planning to pursue advanced work in French after graduation are encouraged to write their senior essay in French.

Students writing a one-term essay enroll in FREN 491 in the senior year. A one-term essay may be written in either the fall or the spring term and should be approximately thirty pages in length. A preliminary statement indicating the general area to be addressed and the name of the adviser must be submitted to the DUS by April 19, 2019 (fall-term essay), or November 8, 2019 (spring-term essay). A one-page prospectus and bibliography are due September 20, 2019 (fall term), or January 24, 2020 (spring term). A rough draft must be submitted to the adviser by November 1, 2019 (fall term), or March 27, 2020 (spring term). Two copies of the final essay are due in the department by December 2, 2019 (fall term), or April 20, 2020 (spring term).

Students electing a two-term essay for the intensive major must select their subject and adviser by the end of the junior year and enroll in FREN 493 and 494 during the senior year. The essay should be approximately sixty pages in length. A preliminary statement indicating the general area to be addressed and the name of the adviser must be submitted to the DUS by April 19, 2019. A one-page prospectus and bibliography are due September 20. Students must submit an initial rough draft to their adviser by January 24 and a complete draft by March 27. Two copies of the final essay are due in the department by April 20.

In place of the thirty-page senior essay for the standard major or the sixty-page senior essay for the intensive major, translation track majors undertake a literary translation of similar length to the senior essay, working with a member of the French Department ladder faculty. The senior translation essay, FREN 492, 495, or 496, should include a critical introduction, of a length to be determined by the student, in consultation with the directing faculty member. The same submission dates as the one-term essay and the two-term essay apply to the translation track essay.

ADVISING

Students in the major are encouraged to take as many advanced courses as possible in all historical periods from the Middle Ages to the present. Candidates for the major should consult the DUS as early as the beginning of the sophomore year and no later than the fall term of the junior year. Schedules must be approved and signed by the DUS. Students planning to study abroad or to petition for completion of two majors should contact the DUS during the sophomore year.

Special Divisional Major The department will support the application of qualified students who wish to pursue an interdisciplinary course in French studies. Under the provisions of the Special Divisional Major, students may combine courses offered by the French department with subjects elected from other departments. Close consultation with departmental advisers is required; candidates for a Special Divisional Major should consult the DUS in French by the fall term of the junior year. For further information, see Special Divisional Majors.

STUDY ABROAD

Students are encouraged to spend a term or a year abroad, for which appropriate course credit is granted. Summer study abroad may also, in some cases, receive course credit. Further information may be obtained from the Center for International and Professional Experience and from (ruth.koizim@yale.edu) Ruth Koizim (ruth.koizim@yale.edu), the study abroad adviser for the Department of French.

REQUIREMENTS OF THE MAJOR

Prerequisite FREN 150 or equivalent

Number of courses *Standard major and translation track*—10 term courses numbered 160 or above (incl senior req); *Intensive major*—12 term courses numbered 160 or above (incl senior req)

Specific course required FREN 170 or equivalent

Distribution of courses *Standard major*—at least 4 courses in Group B numbered 200 or above; no more than 2 courses numbered FREN 180–199; no more than 2 courses conducted in English; *Translation track*— same as standard, except min of 2 translation courses and no more than 4 courses numbered FREN 180–199; *Intensive major*— same as standard, plus 1 addtl Group B course numbered 200 or above

Substitution permitted With prior approval of DUS, up to 4 term courses outside French dept, as specified

Senior requirement *Standard major*—one-term senior essay in French or English (FREN 491); *Translation track*—one-term literary translation essay (FREN 492); *Intensive major*—two-term senior essay in French or English (FREN 493, 494); *Translation track, Intensive major*—two-term literary translation essay (FREN 495, 496)

CERTIFICATE OF ADVANCED LANGUAGE STUDY

The French Department offers a Certificate of Advanced Language Study. A certificate adviser, typically the director of undergraduate studies (DUS), advises students on the certification process and certifies to the University Registrar's Office that students have completed the stated requirements before the end of eight terms of study. The Certificate of Advanced Language Study, once certified, is listed on student transcripts. Once you have fulfilled the requirements indicated below, email Morgane Cadieu (morgane.cadieu@yale.edu) (DUS) and Erin Townsend (erin.townsend@yale.edu) (registrar) and include a copy of your academic record.

REQUIREMENTS

Students seeking to earn the certificate are required to take four courses beyond the L4 level in their chosen language, at least two of which must be Yale courses designated as L5. Additionally the French department requires that a minimum of one of the four required courses be a French department course listed at the 200 level or above. All courses must be taken for a letter grade, and students must achieve a grade of B or above. With the approval of the adviser, one advanced non-L5 course, conducted in the target language, such as an independent study course or a graduate seminar may count toward certification requirements.

The certificate adviser may also approve the substitution of up to two credits earned during study abroad and taught in the target language to count toward the certificate requirements. If the adviser approves courses taken outside of Yale for inclusion in the certificate requirements, students must take the necessary steps to ensure those courses appear on their transcript.

Credit/D/Fail No courses taken Credit/D/Fail may be counted toward the requirements of the certificate.

FACULTY OF THE DEPARTMENT OF FRENCH

Professors R. Howard Bloch, Dominique Brancher (*Visiting*), Marie-Hélène Girard (*Visiting*), Alice Kaplan, Pierre Saint-Amand, Maurice Samuels

Assistant Professors Morgane Cadieu, Thomas C. Connolly, Jill Jarvis, Christophe Schuwey

Senior Lecturers Lauren Pinzka, Maryam Sanjabi, Alyson Waters

Senior Lectors Kathleen Burton, Ruth Koizim, Soumia Koundi, Matuku Ngame, Françoise Schneider, Constance Sherak, Candace Skorupa, Vanessa Vysosias

Lectors Leo Tertrain

Group A Courses

* **FREN 110a, Elementary and Intermediate French I** Staff

Intensive training and practice in all the language skills, with an initial emphasis on listening and speaking. Emphasis on communicative proficiency, self-expression, and cultural insights. Extensive use of audio and video material. Conducted entirely in French. To be followed by FREN 120. For students with no previous experience of French. Daily classroom attendance is required. L1 RP 1½ Course cr

* **FREN 120b, Elementary and Intermediate French II** Staff

Continuation of FREN 110. Open only to students who took FREN 110 (L1) at Yale. Conducted entirely in French. Only after FREN 110. To be followed by FREN 130. L2 RP 1½ Course cr

* **FREN 121a, Intermediate French** Staff

Designed for initiated beginners, this course develops all the language skills with an emphasis on listening and speaking. Activities include role playing, self-expression, and discussion of cultural and literary texts. Emphasis on grammar review and acquisition of vocabulary. Frequent audio and video exercises. Conducted entirely in French. Daily classroom attendance is required. Placement according to placement test score. Online preregistration required; see french.yale.edu for details. L2 RP 1½ Course cr

* **FREN 125a, Intensive Elementary French** Constance Sherak

An accelerated course that covers in one term the material taught in FREN 110 and 120. Practice in all language skills, with emphasis on communicative proficiency. Admits to FREN 145. Conducted entirely in French. For students of superior linguistic ability. No preregistration required. L1, L2 RP 2 Course cr

* **FREN 130a or b, Intermediate and Advanced French I** Staff

The first half of a two-term sequence designed to develop students' proficiency in the four language skill areas. Prepares students for further work in literary, language, and cultural studies, as well as for nonacademic use of French. Oral communication skills, writing practice, vocabulary expansion, and a comprehensive review of fundamental grammatical structures are integrated with the study of short stories, novels, and films. Admits to FREN 140. Conducted entirely in French. After FREN 120, 121, or a satisfactory placement test score. L3 RP 1½ Course cr

* **FREN 140a or b, Intermediate and Advanced French II** Staff

The second half of a two-term sequence designed to develop students' proficiency in the four language skill areas. Introduction of more complex grammatical structures. Films and other authentic media accompany literary readings from throughout the francophone world, culminating with the reading of a longer novel and in-class presentation of student research projects. Admits to FREN 150. Conducted entirely in French. After FREN 130 or a satisfactory placement test score. L4 RP 1½ Course cr

* **FREN 145b, Intensive Intermediate and Advanced French** Staff

An accelerated course that covers in one term the material taught in FREN 130 and 140. Emphasis on speaking, writing, and the conversion of grammatical knowledge into reading competence. Admits to FREN 150. For students of superior linguistic ability. Conducted entirely in French. After FREN 120, 121, or 125. No preregistration required. L3, L4 RP 2 Course cr

* **FREN 150a or b, Advanced Language Practice** Staff

An advanced language course intended to improve students' comprehension of spoken and written French as well as their speaking and writing skills. Modern fiction and nonfiction texts familiarize students with idiomatic French. Special attention to grammar review and vocabulary acquisition. Conducted entirely in French. After FREN 140, 145, or a satisfactory placement test score. May not be taken after FREN 151. Online preregistration required; see <http://french.yale.edu/academics/placement-and-registration> for details. L5 RP

Group B Courses

Group B courses are conducted entirely in French. Courses numbered from 160 to 199 are open to students who have passed FREN 150 or the equivalent, and to others with consent of the department. Courses numbered from 200 to 449 are open to students who have passed FREN 170, or with permission of the instructor. Students who have taken a course at the 200 level or higher may not ordinarily take a 100-level course for credit, with the exception of advanced language courses numbered 185 or higher. Students may take 200-, 300-, and 400-level courses in any order. Courses in the 200–299 range are devoted to general fields; courses in the 300–449 range are devoted to specific topics.

GATEWAY COURSES

*** FREN 160a or b, Advanced Culture and Conversation** Staff

Intensive oral practice designed to further skills in listening comprehension, speaking, and reading through the use of videos, films, fiction, and articles. Emphasis on contemporary French and francophone cultures. Conducted entirely in French.

Prerequisites: FREN 150, 151, or a satisfactory placement test score, or with permission of the course director. May be taken concurrently with or after FREN 170. L5 RP

*** FREN 170a or b, Worlds in French: An Introduction to French and Francophone Literatures** Staff

Introduction to close reading and analysis of literary texts written in French. Works by authors such as Marie de France, Molière, Balzac, Hugo, Baudelaire, Duras, Proust, and Genet. May not be taken after FREN 171. L5, HU

ADVANCED LANGUAGE COURSES

*** FREN 181a, Applied Grammar Workshop** Constance Sherak

In-depth study of grammar and discourse strategies. Advanced grammar exercises, linguistic analysis of literary selections, and English-to-French translation. Intended to improve students' written command of French and to prepare them for upper-level courses; recommended for prospective majors. After FREN 150 or higher, or a satisfactory placement test score. May be taken after courses in the 200–449 range. L5

*** FREN 182b, Creative and Critical Writing Workshop** Lauren Pinzka

An advanced writing course for students who wish to work intensively on perfecting their written French. Frequent compositions of varying lengths, including creative writing, *rédactions* (compositions on concrete topics), and *dissertations* (critical essays). Recommended for prospective majors. Conducted entirely in French. After FREN 150 or higher, or a satisfactory placement test score. May be taken after courses in the 200–449 range. L5

*** FREN 183a, Medical French: Conversation and Culture** Leo Tertrain

An advanced language course emphasizing verbal communication and culture. Designed to foster the acquisition of the linguistic and cultural skills required to evolve within a Francophone medical environment. Discussions, in-class activities, and group projects in simulated professional situations. Topics such as the hospital, family physicians and nurse practitioners, medicine in Francophone Africa, humanitarian NGOs are explored through a medical textbook, articles, video clips, radio shows, films, documentaries, and excerpts from essays and literary texts. Conducted entirely in French. Prerequisite: FREN 150 or a satisfactory placement test score, or with

permission of instructor. May be taken concurrently with or after FREN 160 and FREN 170. L5

* **FREN 184b, Business French: Communication and Culture** Leo Tertrain

An advanced language course emphasizing verbal communication and culture. Designed to foster the acquisition of the linguistic and cultural skills required to evolve within a French business environment. Discussions, in-class activities, and group projects in simulated professional situations. Topics such as the liberalization of the French economy, trading in the European Union, new forms of business organizations, and globalization are explored through a business textbook, articles, video clips, radio shows, films, documentaries, and excerpts from essays and literary texts. Conducted entirely in French. Prerequisite: FREN 150 or a satisfactory placement test score, or with permission of instructor. May be taken concurrently with or after FREN 160 and FREN 170. L5

* **FREN 191a, Translation** Alyson Waters

An introduction to the practice and theory of literary translation, conducted in workshop format. Stress on close reading, with emphasis initially on grammatical structures and vocabulary, subsequently on stylistics and aesthetics. Translation as a means to understand and communicate cultural difference in the case of French, African, Caribbean, and Québécois authors. Texts by Benjamin, Beckett, Borges, Steiner, and others. Readings in French and in English. After FREN 150 and 151 or with permission of instructor. Preference to juniors and seniors. L5, HU

* **FREN 192b, Intermediate Literary Translation** Alyson Waters

A continuation of FREN 191 for students who wish to work on a longer project and to deepen their reading in translation theory.
Prerequisite: FREN 191. L5, HU

GENERAL FIELDS

SPECIAL TOPICS

* **FREN 319a, Montaigne Beyond Skepticism: Learning to Read the *Essais*** Staff

Que sais-je? What do I know? This is Montaigne's motto, engraved on a medal in 1576 at the writer's request. At the crossroad of disciplines, this seminar explores how Michel de Montaigne develops a philosophy of doubt by literary means. We see that he does not naively or theoretically subscribe to the skeptical tradition, but rather proposes a practical and singular use of a non-judgmental attitude in the writing of *Les Essais*—the early modern masterpiece of the French literature of the self. We read essays on topics such as: idleness, education, eroticism, imagination. These texts are coupled with short, theoretical excerpts (Sextus Empiricus, Diogène Laërce, Henri Estienne). Readings and discussion in French. L5, HU

* **FREN 360a, Great Novels of the Twenty-First Century** Morgane Cadieu

Why should a long book be an airport novel or an old classic? What are today's sagas or *romans-fleuves*? In this seminar, we read "great" novels of the 21st-century in both senses of the word: these fictions are long and acclaimed works of art. If our current attention span is supposed to eight seconds, this course is a workshop to develop different forms of paying attention to a text. We discuss the influence of length on our reading and interpretation practices. There won't be more pages to read every week than in any

other course, just fewer texts. We read three long contemporary fictions by Marie NDiaye, Antoine Volodine, and Nina Yargekov. L5, HU TR

* **FREN 366b / HSAR 251b, Writers and Artists in Paris, 1780–1914** Marie-Hélène Girard

Ways in which the transformation of Paris shaped the representation of artists who lived and worked in the French capital from the end of the Old Regime until the eve of World War I. The emergence of Paris as a cultural marker; the role played by the image of the bohemian or the *artiste maudit*. Authors and artists include David, Balzac, Delacroix, Baudelaire, Manet, Mallarmé, impressionist painters, and Picasso. L5, HU

* **FREN 368b, Reasoning with Voltaire** Pierre Saint-Amand

An investigation of the French Enlightenment through its principal representative philosopher, Voltaire. An examination of Voltaire's preoccupations, including philosophy, religion, tolerance, freedom, and human rights. Readings include Voltaire's *contes*, major plays, entries from the *Dictionnaire philosophique*, treatises, and pamphlets. Conducted entirely in French. L5

* **FREN 388b / HUMS 162b, Feminine Voices in French Literature** R. Howard Bloch

An exploration of women's voices in French literature from the Middle Ages to the mid-twentieth century. The specificity of the feminine voice, the plurality of feminine voices, love and sexuality, and social and professional identity. Authors include Marie de France, Marguerite de Navarre, George Sand, Maryse Condé, and Marguerite Duras. Readings and discussion in English. WR, HU

Special Tutorial and Senior Courses

* **FREN 491a or b / FREN 492a or b, The Senior Essay** Morgane Cadieu

A one-term research project completed under the direction of a ladder faculty member in the Department of French and resulting in a substantial paper in French or English. For additional information, consult the director of undergraduate studies.

* **FREN 493a and FREN 494b / FREN 495a and FREN 496b, The Senior Essay in the Intensive Major** Morgane Cadieu

A yearlong research project completed under the direction of a ladder faculty member in the Department of French and resulting in a paper of considerable length, in French or English. For additional information, consult the director of undergraduate studies.

Group C Courses

Courses in this group are conducted in English; readings may be in French or English. Group C courses numbered above 100 are open to all students in Yale College.

* **FREN 096b, Women's Narratives of Self in Modern French Literature** Maryam Sanjabi

The course explores women's autobiographical literature, demonstrating their uniqueness from an individual perspective and capturing the social, economic, religious, and ethnic themes of the period and their authors' intellectual standpoints. The selected books represent a variety of literary genres ranging from memoir to journal, graphic novel, and film scripts with a focus on the 20th and 21st centuries as they appear in the works of: Colette, Simone de Beauvoir, Nathalie Sarraute, Lucie Aubrac, Hélène Berr, Assia Djebar, Ken Bugul, Agnès Varda, Marjane Satrapi, Marguerite Duras, Annie Ernaux, and Camille Laurens among others. This course

thus aims at a critical awareness of what modernity has meant in women's experiences and why debate about its consequences often revolves around women's lives. While some authors explore the coming of age of European gender awareness, others deal with the war and resistance and more recent non-Western voices in French pose the question of identity of the "Other." Course readings include short theoretical essays and a number of secondary works. Conducted in French and English. Papers in French or in English. Readings in French. There is no prerequisite, but students who took FREN 170 or an equivalent will feel comfortable. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

FREN 216a / ENGL 154a / HUMS 134a / LITR 194a, The Multicultural Middle Ages
Ardis Butterfield

Introduction to medieval English literature and culture in its European and Mediterranean context, before it became monolingual, canonical, or author-bound. Genres include travel writing, epic, dream visions, mysticism, the lyric, and autobiography, from the Crusades to the Hundred Years War, from the troubadours to Dante, from the *Chanson de Roland* to Chaucer. HU

FREN 240b / HUMS 201b / LITR 214b, The Modern French Novel Maurice Samuels and Alice Kaplan

A survey of major French novels, considering style and story, literary and intellectual movements, and historical contexts. Writers include Balzac, Flaubert, Proust, Camus, and Sartre. Readings in translation. One section conducted in French. HU TR

* **FREN 307b / LITR 302b, France by Rail: Trains in French Literature, Film, and History** Morgane Cadieu

Exploration of the aesthetics of trains in French and Francophone literature and culture, from the end of the nineteenth-century and the first locomotives, to the automatically driven subway in twenty-first century Paris. Focus on the role of trains in industrialization, colonization, deportation, decolonization, and immigration. Corpus includes novels, poems, plays, films, paintings, graphic novels, as well as theoretical excerpts on urban spaces and public transportation. Activities include: building a train at the CEID and visiting the Beinecke collections and the Art Gallery. May not be taken after FREN 306. WR, HU

* **FREN 369b, Deserts, Oceans, Islands: Literature of Migration & Refuge** Jill Jarvis
A critical study of literature and film that charts different spaces shaped by intersecting – or colliding – routes of colonization and forced migration: deserts (Sahara, Sonoran), oceans (Indian, Atlantic, Mediterranean), and islands (Haiti, Martinique, Zanzibar, Mauritius, Sri Lanka). Students contribute to the *Desert Futures* interdisciplinary symposium to be held at Yale in spring 2020. Seminar is conducted in English. Prerequisite: Reading knowledge of French required (FREN 160 or above; contact instructor with questions about language preparation). HU

* **FREN 394b / FILM 416b / LITR 366b, French Cinema through the New Wave**
Dudley Andrew

The history of French cinema c. 1930 to 1970, from the onset of sound through the New Wave movement. The New Wave "idea of cinema"; the relation of cinema to national self-perception and state policy in France. HU RP

* **FREN 400a / HSAR 458a / HUMS 415a, The Worlds of Chartres Cathedral**

Jacqueline Jung and R. Howard Bloch

An exploration of Chartres Cathedral as a meeting point of various artistic, technological, ritual, literary, intellectual, and social trends in the High Middle Ages. We study what went into building this "chief sanctuary of the Virgin in Western Europe," how the cathedral fit into and changed the world around it, Gothic design and construction, and the literature connected to Chartres as well as to the urban centers of northern France in the twelfth and thirteenth centuries. Topics include: the pre-history of the present cathedral; royal, noble, and local patronage; sculptural programs of the west façade and northern and southern portals; stained glass programs of the west wall, nave, transept (great rose windows), and choir; relics; liturgical and affective experiences of Chartres; the cathedral as a physical, sacred and social space; the cult of the Virgin; new learning and the cathedral school; literary works attached to the Charlemagne window (*The Song of Roland*, *The Pilgrimage of Charlemagne*, *The Pseudo-Turpin*), to the cathedral more generally (The Miracles of Our Lady of Chartres), to the towns of medieval France (Fabliaux); renovation and restoration of post-medieval Chartres. HU

Reading Course

* **FREN 109a, French for Reading** Maryam Sanjabi

Fundamental grammar structures and basic vocabulary are acquired through the reading of texts in various fields (primarily humanities and social sciences, and others as determined by student interest). Intended for students who either need a reading knowledge of French for research purposes or are preparing for French reading examinations and who have had no (or minimal) prior study of French. No preregistration required. Conducted in English. Does not satisfy the language requirement.

Geology and Geophysics

Director of undergraduate studies: Mary-Louise Timmermans (mary-louise.timmermans@yale.edu), 111 KGL, 432-3167; earth.yale.edu

The Geology and Geophysics program prepares students for the application of scientific principles and methods to the understanding of Earth, the environment, and life on a regional and a planetary scale. Subjects range from the history of Earth and life to present-day environmental processes, integrating the study of Earth's deep interior, tectonic plates, oceans, atmosphere, climate, land surface, natural resources, and biota. The emphasis of the curriculum is on employing basic principles from the core sciences (physics, chemistry, and biology) to further an understanding of Earth's past and present, and addressing issues relating to its future. Students gain a broad background in the natural sciences, and also select a specific track to focus their work on planetary or environmental phenomena of particular interest. The four B.S. tracks emphasize hands-on research experience in fieldwork, in laboratories, or in computer modeling. While some graduates continue on to research, consulting, or industrial careers in Earth, environmental, and planetary sciences, the major's broad scientific training prepares students for a wide variety of other paths, including medicine, law, public policy, and teaching. There is also a B.A. degree, which is most suitable for students who wish to study geoscience as a second major, complementing other majors in, for example, Mathematics, Economics, Physics, Biology, or Engineering, and who do so in preparation for a career in law, business, government, or environmental fields.

PREREQUISITES

With permission of the director of undergraduate studies (DUS), acceleration credits awarded at matriculation for high scores on national or international examinations (such as Advanced Placement subject tests) may be used to satisfy prerequisites, even if the student does not choose to accelerate. Higher-level courses may, with the permission of the DUS, be substituted for prerequisites and for specific required courses. For prerequisites specific for each degree and track, see Requirements of the Major.

REQUIREMENTS OF THE MAJOR

B.S. degree program Majors in the B.S. program in Geology and Geophysics choose from four tracks: Atmosphere, Ocean, and Climate; Environmental and Energy Geoscience; Paleontology and Geobiology; and Solid Earth Science. The tracks are suggested pathways to professional careers and major areas of research in geology and geophysics. Students may change tracks during their course of study with guidance from the DUS.

1. The Atmosphere, Ocean, and Climate track provides a comprehensive understanding of the theory, observation, and prediction of the atmosphere-ocean-climate system. Topics range from past climate changes, including the ice ages, to present-day storms and weather, to forecasting climate change and global warming. The prerequisites are CHEM 165 or CHEM 167; PHYS 180, 181 and PHYS 205L, 206L; ENAS 130 or equivalent; and mathematics through differential equations (MATH 120 or ENAS 151, and ENAS 194).

For students in the Class of 2021 and previous classes With approval from the director of undergraduate studies (DUS), the following changes to the requirements of the major may be fulfilled by students who declared their major under previous requirements.

For students in the Class of 2022 and subsequent classes The major requirements consist of at least eleven term courses, for eleven course credits, beyond the prerequisites, including either the senior essay or the senior thesis. To begin study of Earth processes, majors take an introductory course in G&G, with any accompanying laboratory, selected from G&G 100; 110 or 115, and 111L; or 125 and 126L. A higher-level course in G&G can be substituted with the permission of the DUS. Five core courses, totaling five course credits, introduce students to Earth's climate system (G&G 140), meteorology (G&G 322), physical oceanography (G&G 335), fluid mechanics (MENG 361), and statistics or linear algebra (S&DS 230 or 238 or MATH 222). Four electives are chosen from topics in the environment and in processes that govern the atmosphere, ocean, and land surface; physics; and statistics. A list of suggested electives is available from the office of the DUS or on the department website. At least one elective must be from G&G.

2. The Environmental and Energy Geoscience track provides a scientific understanding of the natural and anthropogenic processes that shape the Earth-atmosphere-biosphere system, including energy and material flows among its components. It emphasizes comparative studies of past and current Earth processes to inform models of humankind's role within the environment's future. The prerequisites are broad and flexible and include CHEM 165 or CHEM 167 and mathematics through multivariate calculus (MATH 120 or ENAS 151). Depending on their area of focus, students may choose a prerequisite in physics (PHYS 170, 171; or 180, 181; or 200, 201), or they may choose cellular biology (BIOL 101 and 102, or MCDB 120) and evolutionary biology (BIOL 103 and 104, or E&EB 122, or G&G 125 and 126L). The major requirements consist of at least eleven term courses, for eleven course credits, beyond the prerequisites, including either the senior essay or the senior thesis. To begin study of the Earth system, majors take two introductory courses in G&G, with any accompanying laboratories, selected from G&G 100; 110 or 115, and 111L; or 140. (G&G 125 and 126L may count toward this requirement if not selected as the evolutionary biology prerequisite). Higher-level courses in G&G can be substituted with the permission of the director of undergraduate studies. Four core courses are chosen from topics in general resource use and sustainability (G&G 205), Earth's surface processes (G&G 232), the microbiology of surface and near-surface environments (G&G 255), fossil fuels and energy transitions (G&G 274), renewable energies (G&G 275), geochemical principles (G&G 301), structural geology (G&G 312), meteorology (G&G 322), and satellite-based image analysis (G&G 362). Four electives chosen from Geology and Geophysics, Environmental Studies, Ecology and Evolutionary Biology, Engineering, or related fields provide a broad approach to scientific study of the environment. A list of suggested electives is available from the office of the DUS or on the department website. Electives may be chosen from the core courses, and at least two must be from G&G.

3. The Paleontology and Geobiology track focuses on the fossil record of life and evolution, geochemical imprints of life, and interactions between life and Earth. Topics range from morphology, function, relationships, and biogeography of the fossils themselves, through the contexts of fossil finds in terms of stratigraphy, sediment geochemistry, paleoecology, paleoclimate, and geomorphology, to analysis of the larger causes of paleontological, geobiological, and evolutionary patterns. Integrative approaches are emphasized that link fossil evidence with the physical and chemical evolution of Earth. The prerequisites are college-level biology (BIOL 101–104; or MCDB 120 and E&EB 122); CHEM 165 or CHEM 167; and mathematics through multivariate calculus (MATH 120 or ENAS 151). The major requirements consist of at least thirteen term courses, for twelve course credits, beyond the prerequisites, including either the senior essay or the senior thesis. Students take G&G 100; G&G 110 or 115, and 111L, to gain geological and environmental context, and they are introduced to the fossil record and evolution in G&G 125 and 126L; higher-level courses in G&G can be substituted with the permission of the DUS. Four core courses give majors a comprehensive background in sedimentary rocks and rock correlation (G&G 232 or equivalent), the study of evolution (G&G 250 or equivalent), microbiology in past and present environments (G&G 255 or equivalent), Earth's carbon cycle (G&G 308 or equivalent), and statistical data analysis as applied to the life sciences (S&DS 101 or equivalent). Four electives selected from Geology and Geophysics, Ecology and Evolutionary Biology, Molecular, Cellular, and Developmental Biology, and related fields offer students flexibility in pursuing their specific interests. A list of suggested electives is available from the office of the DUS or on the department website. At least one elective must be from G&G.
4. The Solid Earth Science track emphasizes an integrated geological, geochemical, and geophysical approach to the study of processes operating within Earth and their manifestation on the surface. It includes the structure, dynamics, and kinetics of Earth's interior and their impacts on our environment both in the long term (e.g., the evolution of the land surface) and in the short term (e.g., the causes for natural disasters such as earthquakes, tsunamis, and volcanic eruptions). Students acquire a fundamental understanding of the solid Earth system, both as it exists today and as it has evolved over geologic time scales. The prerequisites are CHEM 165 or CHEM 167; physics (PHYS 170, 171; or 180, 181; or 200, 201); and mathematics through multivariate calculus (MATH 120 or ENAS 151). The major requirements consist of at least eleven courses, for eleven course credits, beyond the prerequisites, including either the senior essay or the senior thesis. To begin study of the Earth system, majors take two introductory courses in G&G, with any accompanying laboratories, selected from G&G 100; 110 or 115, and 111L; 125 and 126L; or 140. Higher-level courses in G&G can be substituted with the permission of the director of undergraduate studies. The core of the track consists of four courses chosen from topics in mountain building and global tectonics (G&G 212), rocks and minerals (G&G 220), sedimentary rocks and processes (G&G 232 or equivalent), geochemical principles (G&G 301), and structural geology (G&G 312). Students also select four electives in geology, geochemistry, geophysics, or related topics. A list of suggested electives is available from the office of the DUS or on the department website. Electives may be chosen from core courses, and at least two must be from G&G.

B.A. degree program The B.A. degree in Geology and Natural Resources requires fewer upper-level courses than the B.S. degree. It may be more appropriate for students who wish to major in two separate Yale programs, who study geoscience in preparation for a career in law, business, government, or environmental fields, or who decide to pursue a science major only after the first year. The prerequisites include mathematics (MATH 115), biology (BIOL 101 and 102, or MCDB 120, or G&G 255), and a lecture course in chemistry. The major requirements consist of at least nine term courses beyond the prerequisites. These include two courses in G&G numbered 100–150, with any accompanying laboratories; courses in natural resources (G&G 205) and geochemical processes (G&G 220 or 232 or 280 or 301); and five additional courses at the 200 level or higher in Geology and Geophysics or related fields, approved by the DUS and including either the senior essay or the senior thesis. Course selections can be guided by any of the B.S. tracks described above.

Credit/D/Fail Geology and Geophysics majors may not employ the Credit/D/Fail option for prerequisites or for courses in the major.

SENIOR REQUIREMENT

Seniors in both degree programs must prepare either a senior essay based on one term of library, laboratory, or field research (G&G 492) or, with the consent of the faculty, a two-term senior thesis (G&G 490, 491), which involves innovative field, laboratory, or theoretical research. Students electing to do a senior thesis must first select a topic and obtain the consent of a faculty member to act as an adviser. They must then petition the faculty through the DUS for approval of the thesis proposal. The petition should be submitted by the end of the junior year. If the two-term senior thesis is elected, G&G 491 may count as an elective toward the major. A copy of each senior thesis or senior essay is made available on the department website.

ADVISING

Qualified juniors and seniors are encouraged to enroll in graduate courses, with permission of the instructor and of the directors of graduate and undergraduate studies. Descriptions of graduate courses are available at the office of the director of undergraduate studies.

Practical experience In addition to prerequisites and required courses in Geology and Geophysics, candidates for the B.A. and B.S. degrees are strongly encouraged to gain practical experience in the Earth sciences. This can be done in two ways: (1) by attending a summer field course at another academic institution, or (2) by participating in summer research opportunities offered by the Department of Geology and Geophysics, by other academic institutions, or by certain government agencies and private industries. Consult the DUS or see the department website for further information.

Combined B.S./M.S. degree program Exceptionally able and well-prepared students may complete a course of study leading to the simultaneous award of the B.S. and M.S. degrees after eight terms of enrollment. See Academic Regulations, section K, Special Arrangements, “Simultaneous Award of the Bachelor’s and Master’s Degrees.” Interested students should consult the DUS prior to the sixth term of enrollment for specific requirements in Geology and Geophysics.

Physics and Geosciences major The Department of Geology and Geophysics also offers a combined major with the Department of Physics. For more information, see Physics and Geosciences.

REQUIREMENTS OF THE MAJOR

Prerequisites *B.A.* – MATH 115; BIOL 101 and 102, or MCDB 120, or G&G 255; a lecture course in chem; *B.S.* – *All tracks* – CHEM 165 or CHEM 167; MATH 120 or ENAS 151; *Atmosphere, Ocean, and Climate track* – ENAS 130 or equivalent; ENAS 194; PHYS 180, 181, 205L, 206L; *Environmental and Energy Geoscience track* – physics (PHYS 170, 171, or 180, 181, or 200, 201) or biology (BIOL 101 and 102, or MCDB 120; and BIOL 103 and 104, or E&EB 122, or G&G 125 and 126L); *Paleontology and Geobiology track* – BIOL 101–104, or MCDB 120 and E&EB 122; *Solid Earth Science track* – PHYS 170, 171, or 180, 181, or 200, 201

Number of courses *B.A.* – at least 9 courses beyond prereqs for letter grades (incl senior req); *B.S.* – *Atmosphere, Ocean, and Climate track* – at least 11 courses, beyond prereqs for letter grades (incl senior req); *Environmental and Energy Geoscience and Solid Earth Science tracks* – at least 11 courses beyond prereqs for letter grades (incl senior req); *Paleontology and Geobiology track* – at least 13 courses, for 12 credits, beyond prereqs for letter grades (incl senior req)

Specific courses required *B.A.* – G&G 205; 1 from G&G 220, or 232, or 280, or 301; *B.S.* – *Atmosphere, Ocean, and Climate track* – G&G 140, 322, 335; MENG 361; S&DS 230 or 238 or MATH 222; *Environmental and Energy Geoscience track* – 4 from G&G 205, 232, 255, 274, 275, 301, 312, 322, 362; *Paleontology and Geobiology track* – G&G 100, 110 or 115, and 111L, G&G 125, 126L, 4 from G&G 232, 250, 255, 308, S&DS 101 or equivalents; *Solid Earth Science track* – 4 from G&G 212, 220, 232 or equivalent, 301, 312

Distribution of courses *B.A.* – 2 intro courses in G&G, with labs, as specified; 5 addtl courses at 200 level or higher in G&G or related fields; *B.S.* – *Atmosphere, Ocean, and Climate track* – 1 intro course in G&G, with lab, as specified; 4 electives as specified; *Environmental and Energy Geoscience and Solid Earth Science tracks* – 2 intro courses in G&G, with labs, as specified; 4 electives as specified; *Paleontology and Geobiology track* – 4 electives as specified

Substitution permitted *All programs* – with DUS permission, higher-level courses for prereqs or required courses

Senior requirement *All programs* – senior essay (G&G 492) or, with permission of faculty, two-term senior thesis (G&G 490, 491)

FACULTY OF THE DEPARTMENT OF GEOLOGY AND GEOPHYSICS

Professors Jay Ague (*Chair*), David Bercovici, Ruth Blake, Mark Brandon, Derek Briggs, David Evans, Alexey Fedorov, Debra Fischer, Jacques Gauthier, Shun-ichiro Karato, Jun Korenaga, Maureen Long, Jeffrey Park, Peter Raymond, Danny Rye, James Sainers, Ronald Smith, Mary-Louise Timmermans (*DUS*), John Wettlaufer

Associate Professor Kanani Lee

Assistant Professors Bhart-Anjun Bhullar, Pincelli Hull, Juan Lora, Noah Planavsky, Alan Rooney

Lecturers Marilyn Fox, Michael Oristaglio, Frank Robinson, Ellen Thomas

Courses

* **G&G 010a, Earth, Resources, Energy, and the Environment** Mary-Louise Timmermans

A first-year science seminar devoted to the understanding of humankind's interactions with, and place within, the natural world. Topics include: Earth's history and early life, evolution and mass extinction, human population growth, industrialization, fossil fuels, pollution, the carbon cycle and global warming, and a planetary perspective on the Earth. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SC

G&G 100a, Natural Disasters David Bercovici and Maureen Long

Natural events and their impact on humanity and the built environment. Earthquakes, volcanoes, tsunamis, landslides, coastal flooding, tornadoes, hurricanes, and meteoritic impacts. Hazard mitigation strategies. Consequences of global warming. SC

* **G&G 105b / APHY 100b / ENAS 100b / EVST 100b / PHYS 100b, Energy Technology and Society** Daniel Prober

The technology and use of energy. Impacts on the environment, climate, security, and economy. Application of scientific reasoning and quantitative analysis. Intended for non-science majors with strong backgrounds in math and science. QR, SC

G&G 110a, Dynamic Earth David Evans and Danny Rye

An introduction to the processes that shape Earth's environment through the interactions of rocks, soils, the atmosphere, and the hydrosphere. Field trips and practical sessions in the properties of natural materials. Topics include evolution of landscapes; hydrologic and tectonic cycles; extreme geologic events such as earthquakes, floods, volcanism, and landslides; society's economic dependence on natural materials such as soils, minerals, and fossil fuels; and human influences on the natural environment. SC

G&G 111La, Dynamic Earth Laboratory and Field Methods Danny Rye and David Evans

Practical exercises in the laboratory and in the field to complement G&G 110 or 115. Identification of minerals and rocks; construction of geologic maps and cross sections to determine Earth-system processes and histories. Includes a field trip to the northern Appalachians during the October recess. After or concurrently with G&G 110, or after G&G 115. SC ½ Course cr

* **G&G 125b / E&EB 125b, History of Life** Derek Briggs, Pincelli Hull, and Bhart-Anjan Bhullar

Examination of fossil and geologic evidence pertaining to the origin, evolution, and history of life on Earth. Emphasis on major events in the history of life, on what the fossil record reveals about the evolutionary process, on the diversity of ancient and living organisms, and on the evolutionary impact of Earth's changing environment. SC

G&G 126Lb, Laboratory for the History of Life Derek Briggs, Pincelli Hull, and Bhart-Anjan Bhullar

A survey of the diversification of life using suites of fossils and related modern organisms drawn from critical evolutionary stages. Emphasis on direct observation and description of specimens, the solution of problems posed by the instructor, and the

generation and testing of hypotheses by the students. To be taken concurrently with or following G&G 125. SC ½ Course cr

G&G 140a, Atmosphere, Ocean, and Climate Change Ronald Smith

Physical processes that control Earth's atmosphere, ocean, and climate. Quantitative methods for constructing energy and water budgets. Topics include clouds, rain, severe storms, regional climate, the ozone layer, air pollution, ocean currents and productivity, the seasons, El Niño, the history of Earth's climate, global warming, energy, and water resources. QR, SC

G&G 211b / EVST 211b / HIST 416b / HSHM 211b, Global Catastrophe since 1750

William Rankin

A history of the geological, atmospheric, and environmental sciences, with a focus on predictions of global catastrophe. Topics range from headline catastrophes such as global warming, ozone depletion, and nuclear winter to historical debates about the age of the Earth, the nature of fossils, and the management of natural resources. Tensions between science and religion; the role of science in government; environmental economics; the politics of prediction, modeling, and incomplete evidence. HU

* **G&G 212b, Global Tectonics** Mark Brandon

The architecture of continents and oceans; detailed geology of lithospheric plate margins and mountain chains. Examples of plate-interaction histories from the ancient geological record emphasize the interdisciplinary approaches used to determine interlinked Earth-system processes involving the mantle, crust, hydrosphere, atmosphere, and biosphere. The course features a field trip during spring break. Prerequisite: one course in G&G (preferably 100, 110, or 115), or permission of instructor. Enrollment limited to 15. SC

[**G&G 215, Global Warming: The Carbon Cycle**]

* **G&G 216b, Global Warming: Climate Physics** John Wettlaufer

Lectures on the basics of global warming and presentations and discussions of some of the classic papers that combined have led to our current understanding of global warming. The knowns and the unknowns of global warming; the paper trail of cutting-edge climate science through time, from the late 1800s to the present. Recommended preparation: basic calculus and physics. SC

G&G 220b, Petrology and Mineralogy Jay Ague

Study of the structures, chemistry, and physical properties of minerals, including common rock-forming minerals found in sedimentary, metamorphic, and igneous rocks, as well as rare and valuable minerals such as precious metals and gemstones. After one year of college-level chemistry; G&G 110 recommended. SC

[**G&G 240, Forensic Geoscience**]

G&G 247a / AMTH 247a / MATH 247 / MATH 447a, Partial Differential Equations

Wilhelm Schlag

Introduction to partial differential equations, wave equation, Laplace's equation, heat equation, method of characteristics, calculus of variations, series and transform methods, and numerical methods. Prerequisites: MATH 222 or 225, MATH 246, and ENAS 194, or equivalents. QR

G&G 255b / EVST 265b, Environmental Geomicrobiology Ruth Blake

Microbial diversity in natural geologic habitats and the role of microorganisms in major biogeochemical cycles. Introduction to prokaryote physiology and metabolic diversity; enrichment culture and molecular methods in geomicrobiology. Prerequisite: college-level chemistry. SC

*** G&G 261a / EVST 261a / F&ES 261a, Minerals and Human Health** Ruth Blake

Study of the interrelationships between Earth materials and processes and personal and public health. The transposition from the environment of the chemical elements essential for life. After one year of college-level chemistry or with permission of instructor; G&G 110 recommended. SC

*** G&G 270b, Herpetology** Bhart-Anjan Bhullar

An examination of the origin and evolution of amphibians and reptiles with particular emphasis on global diversity, the fossil record, and the evolution of body plans. Discussion of classic and current literature provides a sense of the state of the art. Detailed hands-on study of external and internal anatomy heavily employs the collections of the Yale Peabody Museum. Observation of animals in the wild is possible during several optional field trips. Prerequisites: BIOL 101-104, high-school AP-equivalent preparation, or permission of instructor. SC

G&G 274a, Fossil Fuels and World Energy Michael Oristaglio

The origins, geologic settings, exploration, distribution, and extraction of coal, oil, and natural gas as finite Earth resources. The role of fossil fuels in the world's energy systems; environmental impacts of fossil fuels, including climate change; the transition to low-carbon energy sources. Prerequisites: high school chemistry, mathematics, and Earth science. Recommended preparation: G&G 110 or 205. SC

*** G&G 275b, Renewable Energy** Ronald Smith

Introduction to renewable energy, including physical principles, existing and emerging technologies, and interaction with the environment. Energy demand; transmission and storage; generation by hydroelectric, wind, solar, biofuel, and geothermal sources, as well as waves and tidal generation. Includes field trips to conventional, hydroelectric, and wind power facilities in Connecticut. Prerequisites: high school physics, chemistry, and mathematics; college-level science, engineering, and mathematics recommended. SC

[**G&G 280, Organic Geochemistry**]

[**G&G 290, Earthquakes and Volcanoes**]

[**G&G 310, Isotope Geochemistry**]

[**G&G 312, Structural Geology**]

G&G 313a, Invertebrate Paleontology: Evolving Form and Function Derek Briggs

Exploration of the basic constraints and potentials that controlled adaptive radiation in the evolution of the invertebrate skeleton.

G&G 319a, Introduction to the Physics and Chemistry of Earth Materials Shun-ichiro Karato

Basic principles that control the physical and chemical properties of Earth materials. Thermodynamics, equation of state, phase transformations, elastic properties and phase

diagrams. After CHEM 161, 165, or 167 (or CHEM 115), MATH 120, and PHYS 181, or equivalents. QR, SC

G&G 322b, Physics of Weather and Climate Staff

The climatic system; survey of atmospheric behavior and climatic change; meteorological measurements and analysis; formulation of physical principles governing weather and climate with selected applications to small- and large-scale phenomena. After PHYS 181 and MATH 120 or equivalents. QR, SC

[**G&G 323, Climate Dynamics**]

G&G 325a, Vertebrate Paleontology Jacques Gauthier

Phylogeny and evolution of the major clades of vertebrates from Cambrian to Recent, as inferred mainly from the fossilized remains of the musculoskeletal system (cranial, axial, and appendicular skeletons). Special attention given to the evolution of vertebrate feeding, locomotor, and sensory systems. Prerequisite: E&EB 225, or with permission of instructor. SC 1½ Course cr

G&G 326b, Introduction to Earth and Planetary Physics Shun-ichiro Karato

An introduction to the structure and dynamics of Earth and other planets in the context of cosmic evolution. Review of basic physical principles and their applications to geophysics and planetary physics. Star formation and nucleosynthesis; planetary accretion and the birth of the solar system; heat flow, plate tectonics, and mantle dynamics; seismology and geodesy; core dynamics, geomagnetism, and planetary magnetism. Prerequisites: PHYS 181b and MATH 120a or b, or equivalents. QR, SC

G&G 335a, Physical Oceanography Alexey Fedorov

An introduction to ocean dynamics and physical processes controlling large-scale ocean circulation, the Gulf Stream, wind-driven waves, tsunamis, tides, coastal upwelling, and other phenomena. Modern observational, theoretical, and numerical techniques used to study the ocean. The ocean's role in climate and global climate change. After PHYS 181 and MATH 120 or equivalents, or with permission of instructor. QR, SC

G&G 342a / PHYS 342a, Introduction to Earth and Environmental Physics John Wettlaufer

A broad introduction to the processes that affect the past, present, and future features of the Earth. Examples include climate and climate change and anthropogenic activities underlying them, planetary history, and their relation to our understanding of Earth's present dynamics and thermodynamics. Prerequisite: PHYS 170, 171, or 180, 181, or 200, 201, or 260, 261, or permission of instructor. Recommended preparation: familiarity with basic calculus and differential equations. QR, SC

* **G&G 362b / ARCG 362b / EVST 362b, Observing Earth from Space** Ronald Smith

A practical introduction to satellite image analysis of Earth's surface. Topics include the spectrum of electromagnetic radiation, satellite-borne radiometers, data transmission and storage, computer image analysis, the merging of satellite imagery with GIS and applications to weather and climate, oceanography, surficial geology, ecology and epidemiology, forestry, agriculture, archaeology, and watershed management. Prerequisites: college-level physics or chemistry, two courses in geology and natural science of the environment or equivalents, and computer literacy. QR, SC

[G&G 370, Regional Perspectives on Global Geoscience]*** G&G 402b, Paleoclimates** Noah Planavsky

A study of the dynamic evolution of Earth's climate. Topics include warm (the Cretaceous, the Eocene, the PETM, the Pliocene) and cold (the "snowball Earth") climates of the past, glacial cycles, abrupt climate changes, the climate of the past thousand years, and the climate of the twentieth century. After PHYS 181 and one course in meteorology or oceanography, or with permission of instructor. SC

G&G 421b, Geophysical Fluid Dynamics Mary-Louise Timmermans

A survey of fluid dynamics, with applications to planetary atmospheres and oceans. Mathematical models illustrate the fundamental dynamical principles of geophysical fluid phenomena such as waves, boundary layers, flow stability, turbulence, and large-scale flows. Concepts are investigated through laboratory experiments in a rotating water tank. Prerequisites: differential equations, or mathematical physics or equivalent. QR, SC

G&G 428a / AMTH 428a / E&EB 428a / PHYS 428a, Science of Complex Systems Jun Korenaga

Introduction to the quantitative analysis of systems with many degrees of freedom. Fundamental components in the science of complex systems, including how to simulate complex systems, how to analyze model behaviors, and how to validate models using observations. Topics include cellular automata, bifurcation theory, deterministic chaos, self-organized criticality, renormalization, and inverse theory. Prerequisite: PHYS 301, MATH 247, or equivalent. QR, SC

[G&G 450, Deformation of Earth Materials]**[G&G 456, Introduction to Seismology]***** G&G 487a or b, Individual Study in Geology and Geophysics** Mary-Louise Timmermans

Individual study for qualified undergraduates under faculty supervision. To register for this course, each student must submit a written plan of study, approved by the adviser, to the director of undergraduate studies. May be taken more than once for credit. ½ Course cr

*** G&G 488a and G&G 489b, Research in Geology and Geophysics** Mary-Louise Timmermans

Individual study for qualified juniors and seniors under faculty supervision. To register for this course, each student must submit a written plan of study, approved by the adviser, to the director of undergraduate studies.

*** G&G 490a and G&G 491b, Research and Senior Thesis** Mary-Louise Timmermans
Two terms of independent library, laboratory, field, or modeling-based research under faculty supervision. To register for this course, each student must submit a written plan of study, approved by a faculty adviser, to the director of undergraduate studies by the end of the junior year. The plan requires approval of the full G&G faculty.

*** G&G 492a or b, The Senior Essay** Mary-Louise Timmermans

One term of independent library, laboratory, field, or modeling-based research under faculty supervision. To register for this course, each student must submit a written plan

of study, approved by a faculty adviser, to the director of undergraduate studies at the beginning of the term in which the essay is to be written.

German Studies

Director of undergraduate studies: Paul North (paul.a.north@yale.edu), 310 WLH, 432-0782; language program director: Theresa Schenker (theresa.schenker@yale.edu), 323 WLH, 432-6401; german.yale.edu

The major in German Studies covers a broad tradition of more than five centuries in Germany, Austria, Switzerland, and neighboring lands. Students gain deep competence in the German language while also reading celebrated literature, analyzing distinctive artworks in many media, deducing intensive theories, and exploring political, linguistic, and cultural histories. The German faculty works closely with undergraduates to develop their special areas of interest within the rich currents of German culture.

German language courses emphasize listening, speaking, reading, and writing in interaction with authentic cultural materials. The curriculum also introduces students to the basic questions and methods of literary criticism, with a focus on rigorous reading practices for a wide range of works from different genres, disciplines, and historical moments.

German Studies courses are diverse in their topics and highly relevant to other fields of study today. Pioneers in philosophy, political theory, sociology, psychology, history, classical philology, the visual arts, architecture, and music wrote and thought in German, as did founders of the modern natural and practical sciences. Majors discover Kant, Goethe, Beethoven, Einstein, Freud, Kafka, Arendt, and many other thinkers and writers who laid the groundwork for modernity and still hold keys to understanding it.

Germany is the fourth-largest economy in the world, and German is the first language of over 95 million people worldwide. Students with a foundation in the language, literature, history, and intellectual revolutions of Germany are prepared to enter a wide variety of vocations. Majors have gone on to postgraduate study in Germany and the United States, and many have entered top-tier law schools and graduate programs. Recent graduates work in fields as diverse as environmental policy, journalism, arts management, consulting, and engineering, as well as in governmental and nongovernmental organizations and businesses.

PREREQUISITES

Prerequisite to the major are first- and second-year German or the equivalent.

COURSE NUMBERING

Group A courses Courses in Group A (GMAN 110–159) correspond to Yale's L1 to L5 designation of elementary, intermediate, and advanced language courses.

Group B courses Courses in Group B (GMAN 160-level and 170-level) are advanced L5 courses. Readings are in German, and the language of instruction is German. There is no restriction on the number of Group B courses that may count toward the major, provided all requirements are met.

Group C courses Courses in Group C (above GMAN 200) are all other courses. The language of instruction is typically English, but readings may be in German and/or English. Course level and prerequisites vary according to the expectations of the instructors.

PLACEMENT PROCEDURES

An online placement examination will be accessible July 1 through August 15, 2019. See the department website for details. Students wishing to take the placement exam in January should sign up with the language director by December 1, 2019. Students may also consult with the director of undergraduate studies (DUS) or the language director for advice about placement and about language study. Regardless of previous German study, students without a score of 5 on the German Advanced Placement test must take the departmental placement exam in order to enroll in any course above GMAN 110 or 125.

REQUIREMENTS OF THE MAJOR

The major in German Studies consists of ten term courses, including three advanced language courses, four courses in an area of concentration, two electives, and the senior essay. All majors must complete at least one GMAN course numbered in the 150s, one in the 160s, and one in the 170s, plus six additional courses—four in the area of concentration and two electives—from Groups B and C, numbered GMAN 160 and above. With permission of the DUS, some substitutions and exceptions may be possible.

Areas of concentration Each German Studies major selects an area of concentration from five possible choices: (1) literature, (2) media and media theory, (3) history and politics, (4) critical thought, and (5) aesthetics and the arts. The *literature* concentration gives students access to worlds of thought and action. Students learn to read critically poetry, novels, plays, short stories, aphorisms, songs, and other genres. Courses fulfilling the literature concentration include at least one course each in nineteenth- and twentieth-century literature. The concentration in *media and media theory* explores a vibrant tradition of experimentation in new cultural forms and media in the nineteenth and twentieth centuries. Students investigate photography, radio, film, television, and computer media alongside landmark works in media theory. The *history and politics* concentration focuses on world-altering historical events and thought-altering theories of history from the Germanic tradition. Students become familiar with explosive political and social events, including the emancipation of the Jews and the Holocaust, the world wars, unification and reunification, and concepts and models for development in economy, social welfare, law, and environmental policies. The concentration in *critical thought* focuses on traditions of theoretical reflection on society, history, art, and language. Students become familiar with authors such as Kant, Hegel, Marx, Nietzsche, Freud, Benjamin, and Habermas. The *aesthetics and the arts* concentration surveys the rich Germanic traditions in the visual and musical arts, as well as the philosophical study of art beginning in eighteenth-century Germany.

Credit/D/Fail A maximum of two courses taken Credit/D/Fail may count toward the major, with permission of the DUS.

SENIOR REQUIREMENT

Seniors in the standard German Studies major enroll in GMAN 492, a guided senior essay tutorial course. Students meet biweekly with the DUS and staff, and work under the direction of a faculty adviser. The culmination of the tutorial is an essay of approximately thirty pages that gives evidence of careful reading and substantial independent thought. The essay may be written in either English or German, although

only native speakers are encouraged to write an essay in German. Seniors typically write the essay during the fall term. A preliminary statement indicating the general area to be addressed and the choice of adviser should be submitted to the DUS by September 8, 2019; a three-page prospectus and a bibliography are due by September 22. A rough draft must be submitted to the adviser by November 3. The completed essay, due on December 8, 2019, is judged by the faculty adviser and a second reader.

Intensive major Requirements for the intensive major are the same as for the standard major, except that the intensive major replaces one advanced seminar with a second term of the senior essay. In the fall term seniors in the intensive major enroll in GMAN 492 and begin work on their project under the guidance and supervision of a faculty adviser. A significant portion of the research for the essay should involve materials in German. The essay may be written in either English or German, although only native speakers are encouraged to write an essay in German. A detailed prospectus, no longer than three pages, and a bibliography must be submitted to the DUS by October 20, 2019. The student must submit a draft of at least fifteen pages of the essay by December 1, 2019 to receive credit for the first term of the course. The second term, GMAN 493, is devoted to completing the essay, which should be substantial (between fifty and sixty pages); the completed essay must be submitted by April 13, 2020. The senior essay is judged by the faculty adviser and a second reader.

ADVISING

Candidates for the major in German Studies should consult the DUS.

Graduate courses Courses in the Graduate School are open to undergraduates with permission of the instructor and of the directors of undergraduate and graduate studies. Course descriptions may be obtained on the German department website or from the office of the director of graduate studies.

STUDY ABROAD

Students are strongly encouraged to study in Germany for a summer, or for one or two terms on the Year or Term Abroad program. Appropriate course credit toward the major is granted for work in approved programs in Germany. Study abroad is valuable not only for achieving comfortable fluency in German, but also for gaining firsthand knowledge of the German cultural context. The department offers diverse opportunities for study abroad and a scholarship program for summer courses at German universities. Members of the faculty advise and consult with any students wishing to plan study in Germany. Students who have been approved to study abroad and who receive financial aid from Yale are eligible for aid while abroad. For information about the Year or Term Abroad program, see Academic Regulations, section K, Special Arrangements, "Year or Term Abroad." Students who study abroad for one term may count up to two courses toward the major, with approval of the DUS. Students who study abroad for an academic year may count up to four courses toward the major, with approval of the DUS.

REQUIREMENTS OF THE MAJOR

Prerequisites First- and second-year German or equivalent

Number of courses 10 (incl senior req)

Distribution of courses At least 1 GMAN course in the 150s, at least 1 in the 160s, and at least 1 in the 170s; 4 courses in area of concentration and 2 electives (numbered

GMAN 160 and above) from Groups B and C; *Literature concentration* – at least 1 course each in 19th- and 20th-century literature

Substitution permitted With DUS approval, some substitutions and exceptions may be possible

Senior requirement Senior essay tutorial (GMAN 492)

Intensive major Two-term senior essay (GMAN 492 and 493)

CERTIFICATE OF ADVANCED LANGUAGE STUDY

The Department of Germanic Languages and Literatures offers a Certificate of Advanced Language Study in German. A certificate adviser, typically the director of undergraduate studies (DUS), advises students on the certification process and certifies to the University Registrar's Office that students have completed the stated requirements before the end of eight terms of study. The Certificate of Advanced Language Study, once certified, is listed on student transcripts.

REQUIREMENTS

Students seeking to earn the certificate are required to take four courses beyond the L4 level in their chosen language, at least two of which must be Yale courses designated as L5. All courses must be taken for a letter grade, and students must achieve a grade of B or above. With the approval of the certificate adviser, one advanced non-L5 course, conducted in the target language, such as an independent study course, a graduate seminar, or an advanced seminar may count toward certification requirements.

The certificate adviser may allow one “language across the curriculum” (LxC) course, which ordinarily is an advanced seminar with an additional weekly discussion section in the target language, to count toward the certification requirements. The adviser may also approve the substitution of up to two credits earned during study abroad and taught in the target language to count toward the certificate requirements. If the adviser approves courses taken outside of Yale for inclusion in the certificate requirements, students must take the necessary steps to ensure those courses appear on their transcript.

Credit/D/Fail No courses taken Credit/D/Fail may be counted toward the requirements of the certificate.

FACULTY OF THE DEPARTMENT OF GERMANIC LANGUAGES AND LITERATURES

Professors Rüdiger Campe, Carol Jacobs (*Emerita*), Rainer Nägele (*Emeritus*), Fatima Naqvi, Paul North, Brigitte Peucker, Kirk Wetters (*Chair*)

Assistant Professor Katrin Truedstedt

Senior Lectors II Marion Gehlker, Theresa Schenker

Affiliated Faculty Jeffrey Alexander (*Sociology*), Jennifer Allen (*History*), Seyla Benhabib (*Political Science*), David Cameron (*Political Science*), Paul Franks (*Philosophy, Judaic Studies*), Gundula Kreuzer (*Music*), Patrick McCreless (*Music*), Steven Smith (*Political Science*), David Sorkin (*History*), Nicola Suthor (*History of Art*), Katie Trumpener (*Comparative Literature, English*), Jay Winter (*History*)

First-Year Seminar

* **GMAN 051b / LITR 024b, Game of Thrones and the Theory of Sovereignty** Kirk Wetters

Introduction to the classical and modern theory of sovereignty in the context of G.R.R. Martin's popular *Game of Thrones* series (primarily the books, which are formally more complex and narratively more sophisticated than the television series). Although *The Game of Thrones* is obviously not a work of German literature, it addresses theoretical and literary-historical discourses that are prominently represented in the German context. Emphasis on strategies of literary and theoretical analysis; literature as a testing ground for theoretical models; theory as an analytic framework for evaluating literary and cultural depictions. Questioning the basis of the contemporary relevance and popularity of this material in light of questions of tragedy, individual agency, myth (vs. history), realism (vs. fantasy), environmental catastrophe and geopolitics. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR

Group A Courses

* **DUTC 130a, Intermediate Dutch I** Staff

Continued development of reading, writing, and speaking proficiency in Dutch. Students review and improve grammar skills, expand their vocabulary, read newspaper articles, and watch and listen to Dutch newscasts. Prerequisite: DUTC 120 or equivalent. Course taught through distance learning using videoconferencing technology from Columbia University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L3 RP 1½ Course cr

* **DUTC 140b, Intermediate Dutch II** Staff

Use of authentic Dutch texts to expand proficiency in the language and familiarity with the culture. Focus on Dutch cultural themes that reflect students' interests and fields of study. Readings include a novel and news articles on current events. Prerequisite: DUTC 130. Course taught through distance learning using videoconferencing technology from Columbia University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L4 RP 1½ Course cr

* **DUTC 150a, Advanced Dutch** Staff

Continuation of DUTC 140. Focus on improvement of grammatical knowledge; proficiency in reading, writing, and speaking Dutch; and cultural insight and knowledge of Amsterdam and the Netherlands. Prerequisite: DUTC 140 or equivalent. Course taught through distance learning using videoconferencing technology from Columbia University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L5

* **GMAN 110a or b, Elementary German I** Staff

A beginning content- and task-based course that focuses on the acquisition of spoken and written communication skills, as well as on the development of cultural awareness and of foundations in grammar and vocabulary. Topics such as school, family life, and housing. Course materials include a variety of authentic readings, a feature film, and shorter video clips. Tutors are available for extra help. To be followed by GMAN 120. Enrollment limited to 14 per section. Students must preregister through Preference Selection during the online preregistration period. Details and a link to Preference

Selection are provided on the German department Web site at <http://german.yale.edu>.

L1 1½ Course cr

GMAN 120a or b, Elementary German II Staff

Continuation of GMAN 110. A content- and task-based course that focuses on the acquisition of communicative competence in speaking and writing and on the development of strong cultural awareness. Topics such as multiculturalism, food, childhood, and travel; units on Switzerland and Austria. Course materials include a variety of authentic readings, a feature film, and shorter video clips. Tutors are available for extra help. To be followed by GMAN 130. Enrollment limited to 14 per section. Students must preregister through Preference Selection during the online preregistration period. Details and a link to Preference Selection are provided on the German department Web site at <http://german.yale.edu>. L2 1½ Course cr

GMAN 125a, Intensive German I Lieselotte Sippel

Intensive training in speaking, reading, writing, and comprehending the language. Focus on the mastery of formal grammar. For beginning students of superior linguistic ability. L1, L2 2 Course cr

GMAN 130a or b, Intermediate German I Staff

Builds on and expands knowledge acquired in GMAN 120. A content- and task-based course that helps students improve their oral and written linguistic skills and their cultural awareness through a variety of materials related to German literature, culture, history, and politics. Course materials include authentic readings, a feature film, and shorter video clips. Tutors are available for extra help. After GMAN 120 or according to placement examination. Followed by GMAN 140. Enrollment limited to 14 per section. Students must preregister through Preference Selection during the online preregistration period. Details and a link to Preference Selection are provided on the German department Web site at <http://german.yale.edu>. L3 1½ Course cr

GMAN 140a or b, Intermediate German II Staff

Builds on and expands knowledge acquired in GMAN 130. A content- and task-based course that helps students improve their oral and written linguistic skills and their cultural awareness through a variety of materials related to German literature, culture, history, and politics. Course materials include authentic readings, a feature film, and shorter video clips. Tutors are available for extra help. After GMAN 130 or according to placement examination. Normally followed by GMAN 150 or, with permission of the director of undergraduate studies, by GMAN 171. Enrollment limited to 14 per section. Students must preregister through Preference Selection during the online preregistration period. Details and a link to Preference Selection are provided on the German department Web site at <http://german.yale.edu>. L4 1½ Course cr

GMAN 145b, Intensive German II Lieselotte Sippel

Continuation of GMAN 125. Focus on speaking, writing, and the conversion of grammatical knowledge into reading competence for literary and scholarly purposes. Prerequisite: GMAN 125. L3, L4 RP 2 Course cr

* **GMAN 151b, Exploring Contemporary German Culture** Staff

Advanced German course focusing on vocabulary expansion through reading practice; stylistic development in writing; and development of conversational German. Critical analysis of selected aspects of contemporary German culture, such as Green Germany,

social movements from the 60s to today, the changing "Sozialstaat," and current events. Prerequisite: GMAN 140 or equivalent. L5

* **GMAN 152a, Advanced German, Contemporary Germany** Theresa Schenker
An advanced language and culture course focusing on contemporary Germany. Analysis and discussion of current events in Germany and Europe through the lens of German media, including newspapers, books, TV, film radio, and modern electronic media formats. Focus on oral and written production to achieve advanced linguistic skills. After GMAN 140 or 145. For entering students with a score of 5 on the German Advanced Placement test, or according to results of the placement examination. Students must preregister through Preference Selection during the online preregistration period. Details and a link to Preference Selection are provided on the German department Web site at <http://german.yale.edu>. L5, HU

Group B Courses

* **DUTC 160b, Advanced Dutch II** Staff
Continuation of DUTC 150. Focus on improvement of grammatical knowledge; proficiency in reading, writing, and speaking Dutch; and cultural insight and knowledge of Amsterdam and the Netherlands. Prerequisite: DUTC 150 or equivalent. Course taught through distance learning using videoconferencing technology from Columbia University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L5

* **GMAN 162a, Pre-1945 German Culture and History** Marion Gehlker
An advanced language course focusing on improving upper-level written and oral language skills through the discussion of selected aspects of pre-1945 German culture, politics, and history in literary and nonliterary texts, films, and the arts. Topics include the Kaiserreich, the Weimar Republic, Expressionist art and film, youth movements, social democracy, and Nazi Germany. Emphasis on vocabulary building through frequent oral and written assignments. After GMAN 140, 145, or 150, or with permission of instructor. L5, HU

* **GMAN 163b, The Afro-German Experience** Theresa Schenker
Investigation of the history and culture of Afro-Germans. Topics include pre-colonial contacts between Africans and Germans, German colonies in Africa, and the Afro-German fate during and after the Nazi regime. Strong focus on the experience of Afro-Germans in contemporary Germany as seen in Afro-German fictional and non-fictional texts and media. Course culminates in an analysis of the image of people of color and questions of racism in Germany today Prerequisites: German 150, another advanced German class, or with permission of instructor. L5, HU

* **GMAN 173a, Introduction to German Lyric Poetry** Staff
The German lyric tradition, including classic works by Goethe, Schiller, Hölderlin, Eichendorff, Heine, Mörike, Droste-Hülshoff, Rilke, George, Brecht, Trakl, Celan, Bachmann, and Jandl. Attention to the German *Lied* (art song). Development of advanced reading, writing, speaking, and translation skills. Prerequisite: GMAN 150 or equivalent. L5, HU

Group C Courses

Unless otherwise indicated, courses in this group are conducted in English with both readings and discussion in English. The courses are open to all students in Yale College.

GMAN 208a / HIST 254a, Germany from Unification to Refugee Crisis Jennifer Allen
The history of Germany from its unification in 1871 through the present. Topics include German nationalism and national unification; the culture and politics of the Weimar Republic; National Socialism and the Holocaust; the division of Germany and the Cold War; the Student Movement and New Social Movements; reunification; and Germany's place in contemporary Europe. HU

* **GMAN 226a / LITR 218a, The Faust Tradition** Jan Hagens
The development of the Faust motif through time, from the period of the Renaissance and the Reformation to the twentieth century. Readings from the English adaptation of the original German chapbook and from works by Marlowe, Ben Jonson, Goethe, Wilde, Bulgakov, and Thomas Mann. Screenings of films with a Faustian theme. HU

* **GMAN 227a / HUMS 330a / LITR 330a / PHIL 402a, Heidegger's Being and Time**
Martin Hägglund
Systematic, chapter by chapter study of Heidegger's *Being and Time*, arguably the most important work of philosophy in the twentieth-century. All major themes addressed in detail, with particular emphasis on care, time, death, and the meaning of being. HU

* **GMAN 247b / LITR 201b, Goethe's Wilhelm Meister** Kirk Wetters
A detailed study of Goethe's 1795/96 *Wilhelm Meister's Apprenticeship* – the first novel of the nineteenth century and the prototypical novel of education (*Bildungsroman*); engagement with critical and scholarly reception starting with Schiller and Schlegel, theories of the novel and transformations of modern society. Readings and discussion in English. HU

* **GMAN 273a / FILM 319a / LITR 368a, The Third Reich in Postwar German Film, 1945–2007** Jan Hagens
Close study of the intersection of aesthetics and ethics with regard to how German films, since 1945, have dealt with Nazi history. Through the study of German-language films (with subtitles), produced in postwar East, West, and unified Germany through 2007, students consider and challenge perspectives on the Third Reich and postwar Germany, while learning basic categories of film studies. HU

* **GMAN 316b / HUMS 317b, The Death Sentence: When the State Kills** Paul North
The political, economic, and philosophical figure of the “death sentence,” although it has archaic roots, continues to haunt the 21st century. “Capital punishment,” often understood as the paradigmatic, final, and ultimate form of sovereign power, forms only the starting point of our inquiry. If it is the case that, as John Locke writes quoting Cicero, *salus populi suprema lex esto* (the safety of the people should be the supreme law), and if, furthermore, this maxim extends in the name of national security up to and including the point where the lives of certain people and populations are thrown into question, then all instances where the state kills, sanctions killing, or benefits directly or indirectly from the killing of its own citizens must be in question in the course. It may seem strange – modern politics, economics, and philosophy all begin from death sentences. The French revolution depended on bloody executions that were “necessary” for founding a new polity. The Atlantic slave trade condemned

millions of Africans to death, under economic reasoning, for the benefit of world capitalism. Athens killed the philosopher Socrates because he was dangerous to the polis, and philosophy has enshrined this death sentence as its mythical origin and its most modern moment. We investigate the stories and logics these events have in common. Why does the state kill its own? Why are death sentences necessary for the current complex of state-nation-capital? Why did "barbaric" practices not end with enlightenment, the critique of religion, scientific rationalism, modernization, capitalism? Answers to these questions come from texts in political theory, philosophy, history, and the social sciences. HU

* **GMAN 323a, Vienna 1900-1938** Staff

The Vienna of 1900 – of Freud, Schnitzler, Strauss, Hofmannsthal, Kraus, Musil, Mahler, Schönberg, Klimt, Schiele, and Wittgenstein – has become the stuff of myth. For good reason: at the turn of the 20th century, the capital of the multi-ethnic, multi-lingual Habsburg Empire became a focal point for experimentation in literature, fine art, architecture, music, film, psychology, and philosophy. In this course, we examine the emergence of new aesthetic strategies and the development of psychoanalysis; we delve into questions of representation and language. How do the artists of the time thematize the pressures of urbanization, secularization, ethnic conflict, cosmopolitanism, sexuality, gender, and consciousness? Continuing into the interwar period, we examine the collapse of empire and its ramifications for architecture, urban planning, and artistic representation. The post-1918 period, leading up to the rise of fascism in the early 1930s and Austria's Anschluss, witnessed the emergence of progressive social ideals in the public sphere, from childcare to public housing projects. Women writers move to the forefront as chroniclers and analysts of squalid living conditions, rising anti-Semitism, and gender disparities. We also look at the fin-de-siècle's powerful afterlife and its subsequent mythologization and we explore issues of temporality, ethnicity, and media (such as the serialized publication of literary texts, the proliferation of cinemas, and the development of the telephone network).

HU

* **GMAN 365b / LITR 460b, The Contemporary German Novel, 1945-2019** Rüdiger Campe

This course discusses exemplary novels in German language after 1945 from West and East Germany, Germany after Reunification, from Austria, and from Switzerland. Part I, "Zero Hour – or Not," covers political critique of Nazi Germany and the attempt of aesthetic clean break (e.g., Gunther Grass, Wolfgang Koeppen, Ingeborg Bachmann, Max Frisch); Part II "1968: Revolution or New Interiority," covers social protest versus aesthetic internationalism (e.g., Peter Handke, Christa Wolf, Hubert Fichte, Thomas Bernhard); and Part III, "The Attempt of Being Contemporary," covers German and German speaking societies in the global world (e.g., Elfriede Jelinek, Daniel Kehlmann, Yoko Tawada, Rainald Goetz). While "contemporaneity" is the particular mark of the last section, all works desire to critically intervene in their moment and their place in time. Giving an account of this desire is the goal of the course. Contextualization as needed; close reading of selected passages as the mode of work; all works are provided in English translation and German. HU

GMAN 381a / PHIL 204a, Kant's Critique of Pure Reason Paul Franks

An examination of the metaphysical and epistemological doctrines of Kant's *Critique of Pure Reason*. Prerequisite: PHIL 126 or DRST 004. HU

* **GMAN 411b / ER&M 416b / HUMS 342b / JDST 327b / LITR 406b, World Literature** Hannan Hever

The concept of world literature, from its origins in eighteenth-century cosmopolitanism represented by Herder and Goethe up to contemporary critical debates (Apter, Casanova, Cheah, Damrosch, Dharwadker, I. Hesse, Moretti, Mufti, Pollock, Said, Spivak). World literature in relation to national literature, German-language, and Jewish literature; translation, untranslatability, the effect of markets, diaspora, politics. Literary critical readings supplemented by exemplary literary texts in multiple genres. Student contributions based on individual linguistic backgrounds. HU

Reading Courses

* **GMAN 100a, German for Reading** Staff

Students learn the skills with which to read German-language texts of any difficulty with some fluency. Study of syntax and grammar; practice in close reading and translation of fiction and expository prose in the humanities and sciences. Conducted in English. Does not satisfy the language distributional requirement.

* **GMAN 102a / JDST 416a, Reading Yiddish** Joshua Price

This course is designed to build literacy in Yiddish, the vernacular of Ashkenazi Jewry. With focus on the accelerated treatment of Yiddish grammar, regularly supplemented with simple primary texts (poems, songs, folktales), and followed by close readings of (modern) Yiddish literature, students will be able to navigate most Yiddish texts with the aid of a dictionary. May not be taken concurrently with elementary or intermediate German.

* **GMAN 103b / JDST 418b, Reading Yiddish II** Joshua Price

Intermediate study of Yiddish literary language with annotated readings from classic authors including: Mendele, Sholem Aleichem, Peretz, Bergelson, Der Nister, Bashevis, as well as American and Soviet Yiddish poetry. Secondary readings in English will offer a broader introduction to the modern Yiddish canon. Continuation of GMAN 102/ JDST 416. Previous knowledge of German or Hebrew-Aramaic recommended but not required.

Senior Courses

* **GMAN 478a or b, Directed Readings or Individual Research in Germanic Languages and Literatures** Staff

Individual study under faculty supervision. Applicants must submit a prospectus and bibliography approved by the faculty adviser to the director of undergraduate studies. The student meets with the adviser at least one hour each week and takes a final examination or writes a term paper. No credit granted without prior approval of the director of undergraduate studies.

* **GMAN 492a and GMAN 493b, The Senior Essay Tutorial** Paul North

Preparation of an original essay under the direction of a faculty adviser.

Global Affairs

Director of undergraduate studies: Sigga Benediktsdottir
(sigridur.benediktsdottir@yale.edu), 202 Horchow Hall, 432-3418; jackson.yale.edu/
ba-degree

The Global Affairs major, administered by the Jackson Institute for Global Affairs, prepares Yale students for global citizenship and service by enhancing their understanding of the world around them. Students in this interdisciplinary major develop expertise in contemporary global affairs that is strongly grounded in the social sciences.

Students in the Global Affairs major have the flexibility to shape their own curriculums according to their interests and ambitions. In the past, students have concentrated their course work on economic development and poverty, global health, global climate policy, international relations, and foreign policy and diplomacy, with topics relevant to national and human security.

COURSES FOR NONMAJORS

Most Global Affairs courses are open to both majors and nonmajors. If a Global Affairs course requires an application, the application will be posted on the Jackson Institute website.

PREREQUISITES

There are no prerequisites for the Global Affairs major. However, students interested in applying to the major are encouraged to complete the introductory economics sequence (ECON 108, 110, or 115 and ECON 111 or 116) and work toward the foreign language requirement early in their course planning. An introductory analysis course, such as GLBL 121, ECON 131, or S&DS 100–106 is suggested.

REQUIREMENTS OF THE MAJOR

Requirements of the major for the Class of 2020 With the approval of the director of undergraduate studies (DUS), the following changes to the requirements of the major may be fulfilled by students who declared their major under previous requirements.

Requirements of the major for the Class of 2021 and subsequent classes Thirteen term courses are required for the major in addition to a foreign language requirement. Introductory courses in microeconomics (ECON 108, 110, or 115) and macroeconomics (ECON 111 or 116) are required, as is ECON 121 or 125. All majors must take the core courses GLBL 225 and 275, and three courses in quantitative and other methods, including GLBL 121 and GLBL 122. Majors also take four electives chosen from an approved group of courses in Global Affairs, History, Political Science, Economics, and other social science departments; and GLBL 499 Senior Capstone Project.

For information about which courses qualify as electives, see the Jackson Institute website and the course listings in this bulletin.

Language requirement Global Affairs majors are required to take a course designated L5 in a modern language other than English. In exceptional cases, a demonstration of proficiency can fulfill this requirement.

Credit/D/Fail Courses taken Credit/D/Fail may not be applied to the requirements of the major, with the exception that a grade of Credit in an L5 language course may be used to demonstrate proficiency in a foreign language.

Roadmap See visual roadmap of the requirements.

SENIOR REQUIREMENT

In the fall term of the senior year, majors must complete a capstone project in GLBL 499. Small groups of students are each assigned to a policy task force in which they apply their academic training in the social sciences to a specific problem relevant to global affairs. Each task force presents its findings and recommendations to a real-world client such as a government agency, a nongovernmental organization or nonprofit group, or a private-sector organization in the United States or abroad.

ADVISING AND APPLICATION TO THE MAJOR

Students apply to the Global Affairs major in the fall of the sophomore year. The number of students accepted into the major is limited, and selection is competitive. The call for applications is posted each year on the Jackson Institute website, circulated through the residential college deans' offices, and noted on the Advising Resources website. For application information, visit the Jackson Institute website.

Internships Students in the major are encouraged to take a summer internship in the field of global affairs after their junior year. The Jackson Institute's Career Services Office can help students find appropriate internships.

STUDY ABROAD

Global Affairs majors who plan to study abroad should consult the director of student affairs, Lily Sutton (lily.sutton@yale.edu), to devise a course of study prior to the term abroad.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 13 (incl senior req; excluding lang req)

Specific courses required ECON 108, 110, or 115; ECON 111 or 116; ECON 121 or 125; GLBL 225; 275

Distribution of courses 3 quantitative and other methods courses, incl GLBL 121 and 122; 4 approved electives

Language requirement Advanced ability (L5) in 1 modern lang other than English

Senior requirement Senior capstone project in GLBL 499

FACULTY ASSOCIATED WITH THE PROGRAM OF GLOBAL AFFAIRS

Professors David Engerman (*History*), John Gaddis (*History*), Jacob Hacker (*Political Science*), Oona Hathaway (*Law*), Amy Kapczynski (*Law, Global Health*), Paul Kennedy (*History*), Robert T. Jensen (*School of Management*), James Levinsohn (*Director*) (*School of Management*), A. Mushfiq Mobarak (*School of Management*), Samuel Moyn (*Law*), Catherine Panter-Brick (*Anthropology*), Peter Schott (*Economics, School of Management*), Ian Shapiro (*Political Science*), Timothy Snyder (*History*), Jing Tsu (*East Asian Languages and Literatures*), Aleh Tsyvinski (*Economics*), Odd Arne Westad (*History*), Steven Wilkinson (*Political Science*), Ernesto Zedillo (*International Economics & Politics*)

Associate Professors Alexandre Debs (*Political Science*), Kaveh Khoshnood (*Public Health*), Jason Lyall (*Political Science*), Nuno Monteiro (*Political Science*), Marci Shore (*History*), Jonathan Wyrzten (*Sociology, International Affairs*)

Assistant Professors Lorenzo Caliendo (*Economics, School of Management*), Zack Cooper (*Public Health*), Gregg Gonsalves (*School of Public Health*), Lloyd Grieger (*Sociology*), Alice Miller (*School of Public Health, Law*), Thania Sanchez (*Political Science*), Kristina Talbert-Slagle (*School of Medicine, Global Health*)

Senior Lecturers Marnix Amand, Sigga Benediktsdottir, Charles Hill (*International Security Studies*), Asha Rangappa, Justin Thomas

Lecturers Michael Brenes, Christopher Fussell, William Casey King, Nicholas Lotito (*Political Science*), Alice Miller (*Public Health, Law*), Jaimie Morse, Nathaniel Raymond, Daniel Steinmetz-Jenkins, Edward Wittenstein

Senior Fellows Eric Braverman, David Brooks, Howard Dean, Janine di Giovanni, Robert Ford, Clare Lockhart, Stanley McChrystal, Rakesh Mohan, David Rank, Stephen Roach, Emma Sky

Courses

GLBL 101a, Gateway to Global Affairs Emma Sky

Collaboration between faculty and practitioners to discuss key topics and themes related to diplomacy, development, and defense. so

GLBL 121a, Applied Quantitative Analysis Justin Thomas

Mathematical fundamentals that underlie analytical approaches in public policy and the social sciences. Development of mathematical skills in areas such as linear functions, single and multiple variable differentiation, exponential functions, and optimization. Statistical approaches include descriptive statistics, principles of sampling, hypothesis tests, simple linear regression, multiple regression, and models for analyzing categorical outcomes. QR

* **GLBL 122b, Applied Quantitative Analysis II** Justin Thomas

This course introduces students to multiple regression analysis and other tools of causal inference and program evaluation. The course focuses on applying these tools to real data on various topics in global affairs and public policy. Applications are drawn from a wide range of areas including education, social welfare, unemployment, security, health, immigration, the environment, and economic development. We develop the core analytical tools of single and multi-variable regression and discuss fixed effects, difference-in-difference, natural experiment, instrumental variables, regression discontinuity, event study, and matching approaches. Students are trained to thoughtfully produce their own empirical research and to critically consume empirical research done by others. Prerequisite: GLBL 121 or equivalent. QR

* **GLBL 193b / HLTH 240b, Epidemiology and Public Health** Marney White

A general introduction to epidemiology and the field of public health. Methods of epidemiological investigation, research, and practice. Emphasis on study design and the skills necessary for the conduct of mentored field research. Priority to Global Health Fellows.

*** GLBL 195b / PLSC 341b, The Logic of Randomized Experiments in Political Science**

Alexander Coppock

Instruction in the design, execution, and analyzation of randomized experiments for businesses, nonprofits, political organizations, and social scientists. Students learn to evaluate the impact of real-world interventions on well-defined political, economic, and social outcomes. Specific focus on randomized experimentation through field and survey experiments, with design and analysis principles extending to lab and so-called "natural" experiments. Any introductory probability or statistics course. QR

GLBL 217a / EVST 292a / PLSC 149a, Sustainability in the Twenty-First Century:

Environment, Energy, and the Economy Daniel Esty

Sustainability as a guiding concept for addressing twenty-first century tensions between economic, environmental, and social progress. Using a cross-disciplinary set of materials from the "sustainability canon," students explore the interlocking challenges of providing abundant energy, reducing pollution, addressing climate change, conserving natural resources, and mitigating the other impacts of economic development. SO

GLBL 223b / HLTH 230b, Global Health: Challenges and Responses Kristina Talbert-

Slagle

Overview of the determinants of health and how health status is measured, with emphasis on low- and middle-income countries. The burden of disease, including who is most affected by different diseases and risk factors; cost-effective measures for addressing the problem. The health of the poor, equity and inequality, and the relationship between health and development. SO

*** GLBL 225b, Approaches to International Development** Robert Jensen

The unique set of challenges faced by households in developing countries, and the economic theories that have been developed to understand them. Health, education, and discrimination against women in the household; income generation, savings, and credit; institutions, foreign aid, and conflict. Recent econometric techniques applied to investigate the underlying causes of poverty and the effectiveness of development programs. Enrollment limited to sophomores, juniors, and seniors. Prerequisite: GLBL 121. QR, SO

*** GLBL 233b / ECON 470b / EP&E 232b, Strategies for Economic Development**

Rakesh Mohan

How strategies for economic development have changed over time and how dominant strands in development theory and practice have evolved. Students trace the influence of the evolution in thinking on actual changes that have taken place in successful development strategies, as practiced in fast growing developing countries, and as illustrated in case studies of fast growth periods in Japan, South Korea, Brazil, China, and India. Prerequisites: introductory microeconomics and macroeconomics.

GLBL 234b / ECON 184b, International Economics Peter Schott

Introduction to conceptual tools useful for understanding the strategic choices made by countries, firms, and unions in a globalized world. After two terms of introductory economics. SO

GLBL 236b / PLSC 182b, The Politics of International Law and Cooperation Tyler Pratt

This course focuses on the political processes and institutions that facilitate cooperation among states. Students examine the obstacles to cooperation in the international arena, the reasons for the creation of international laws and institutions, and the extent to which such institutions actually affect state policy. Students also explore the tension between international cooperation and concerns about power, state sovereignty, and institutional legitimacy. Course materials draw from a variety of substantive issues, including conflict prevention, trade, human rights, and environmental protection. SO

* **GLBL 250a / HIST 144Ja, Lessons of the Past** Michael Brenes

This course explores how American policymakers have used or misused history in making foreign policy decisions since World War I. In addition to the course readings on this topic, students examine the archives of American diplomats and policymakers behind those decisions. Students are introduced to the vast archival holdings of the Yale Library in diplomatic and international history, and are expected to use archival collections in their assignments. We discuss historical methods and the process of archival research alongside the history of 20th century American foreign policy. HU

* **GLBL 253b / ARCH 341b / LAST 318b, Globalization Space** Keller Easterling

Infrastructure space as a primary medium of change in global polity. Networks of trade, energy, communication, transportation, spatial products, finance, management, and labor, as well as new strains of political opportunity that reside within their spatial disposition. Case studies include free zones and automated ports around the world, satellite urbanism in South Asia, high-speed rail in Japan and the Middle East, agripoles in southern Spain, fiber optic submarine cable in East Africa, spatial products of tourism in North Korea, and management platforms of the International Organization for Standardization. HU

* **GLBL 261a / PLSC 409a, Civil Conflict** Bonnie Weir

Forms of civil conflict and political violence and theories about reasons for and implications of these types of violence. Natural and philosophical foundations of political violence; the potential roles of ethnicity, economic factors, territory, and political institutions and structures in the onset and dynamics of civil conflict; problems of conflict termination.

GLBL 268b / PLSC 111b, Introduction to International Relations Nicholas Lotito

Survey of key debates and concepts in international relations. Exploration of historical and contemporary issues using Western and non-Western cases and evidence. Topics include the rise of states; causes, conduct, and outcomes of wars; the emergence of new actors and forms of conflict; and evolution of global economy. SO

* **GLBL 271a / MMES 271a, Middle East Politics** Emma Sky

Exploration of the international politics of the Middle East through a framework of analysis that is partly historical and partly thematic. How the international system, as well as social structures and political economy, shape state behavior. Consideration of Arab nationalism; Islamism; the impact of oil; Cold War politics; conflicts; liberalization; the Arab-spring, and the rise of the Islamic State. SO

* **GLBL 274a or b / PLSC 137a or b, Terrorism** Bonnie Weir

Theoretical and empirical literature used to examine a host of questions about terrorism. The definition(s) of terrorism, the application of the term to individuals

and groups, the historical use and potential causes of terrorism, suicide and so-called religious terrorism, dynamics within groups that use terrorism, and counterterrorism strategies and tactics. Theoretical readings supplemented by case studies. SO

* **GLBL 275a, Approaches to International Security** Nuno Monteiro

Introduction to major approaches and central topics in the field of international security, with primary focus on the principal man-made threats to human security: the use of violence among and within states, both by state and non-state actors. Priority to Global Affairs majors. Non-majors require permission of the instructor. SO

* **GLBL 284b / PLSC 167b, Mass Atrocities in Global Politics** David Simon

Examination of the impact of global politics and institutions on the commission, execution, prevention, and aftermath of mass atrocities. SO

* **GLBL 288b, Civil-Military Relations and Democratization** Nicholas Lotito

This course explores the role of the military in politics, with a focus on processes of democratization. It introduces students to concepts of civilian control, professionalization, and military intervention. The course introduces significant cases from twentieth-century history and surveys contemporary military politics. Topics include coups d'état, responses to revolution, and democratic transition. SO

* **GLBL 289b / HIST 245Jb / PLSC 431b, War and Peace in Northern Ireland** Bonnie Weir

Examination of theoretical and empirical literature in response to questions about the insurgency and uneasy peace in Northern Ireland following the peace agreement of 1998 which formally ended the three-decade long civil conflict known widely as The Troubles and was often lauded as the most successful of its kind in modern history. Consideration of how both the conflict and the peace have been messier and arguably more divisive than most outside observers realize. SO

* **GLBL 301a / MMES 305a, Environmental Security in the Middle East** Kaveh Madani

This course overviews how environmental, water, food, energy, and climate change have increasingly become linked to human and national security in the Middle East. It begins by exploring the state of the environment in the region and how the policies of the Middle East governments have led to serious environmental degradation and subsequent loss of jobs, migration, social tension, violence, and regional conflicts. Drawing on an in-depth analysis of contemporary case/country studies, students learn how these problems can serve as major human and national security threats. This interdisciplinary course is of interest to students with background/interest in environmental science/engineering, ecology, geography, geosciences, social/political sciences, public policy, security and peace building, international relations, diplomacy, and global affairs.

* **GLBL 306a / AFST 306a, Social Enterprise in Developing Economies II** Robert Hopkins

Summer research developed into a case-study project on a topic related to the use of social enterprise in regional economic development. GLBL 305

* **GLBL 310a / ECON 407a, International Finance** Ana Fielor

A study of how consumers and firms are affected by the globalization of the world economy. Topics include trade costs, the current account, exchange rate pass-through,

international macroeconomic co-movement, multinational production, and gains from globalization. Prerequisite: intermediate macroeconomics or equivalent.

* **GLBL 311a / ECON 480a, Banking Crises and Financial Stability** Sigridur Benediktsdottir

Focus on systemic risk, banking crises, financial stability and macroprudential policies. Additional emphasis on systemic risk and prudential policies in peripheral European economies and emerging economies. Prerequisites: ECON 115 and 116, or equivalent. SO

* **GLBL 312b / EAST 454b / ECON 474b, Economic and Policy Lessons from Japan** Stephen Roach

An evaluation of modern Japan's protracted economic problems and of their potential implications for other economies, including the United States, Europe, and China. Policy blunders, structural growth impediments, bubbles, the global economic crisis of 2008, and Abenomics; risks of secular stagnation and related dangers to the global economy from subpar post-crisis recoveries. Focus on policy remedies to avert similar problems in other countries. Prerequisite: an introductory course in macroeconomics. SO

* **GLBL 315b, Economics of the EU** Marnix Amand

The functioning of the economy of the European Union, both from a theoretical perspective (trade theory, monetary union, etc.) and from a practical perspective. Particular emphasis on the recent crises of the last ten years with effort to put these crises in a larger geostrategic context. Prerequisites: ECON 110 or 115 and ECON 111 or 116. SO

GLBL 318a / EAST 338a / ECON 338a, The Next China Stephen Roach

Economic development in China since the late 1970s. Emphasis on factors pushing China toward a transition from its modern export- and investment-led development model to a pro-consumption model. The possibility of a resulting identity crisis, underscored by China's need to embrace political reform and by the West's long-standing misperceptions of China. Prerequisite: introductory macroeconomics. SO

* **GLBL 331a / ECON 454a / EP&E 254a, Evolution of Central Banking** Rakesh Mohan

Changes in the contours of policy making by central banks since the turn of the twentieth century. Theoretical and policy perspectives as well as empirical debates in central banking. The recurrence of financial crises in market economies. Monetary policies that led to economic stability in the period prior to the collapse of 2007–2008. Changes in Monetary Policies since the Great Financial Crisis. Prerequisite: ECON 122. SO

* **GLBL 336a / EP&E 243a / LAST 423a / PLSC 423a, Political Economy of Poverty Alleviation** Ana De La O

Overview of classic and contemporary approaches to the question of why some countries have done better than others at reducing poverty. Emphasis on the role of politics. SO

* **GLBL 342b / HIST 482Jb / PLSC 321b, Studies in Grand Strategy I** Beverly Gage

The study of grand strategy, of how individuals and groups can accomplish large ends with limited means. The spring term focuses on key moments in history that illustrate strategic thinking in action. During the summer, students undertake research

projects or internships analyzing strategic problems or aspects of strategy. The following fall, students put their ideas into action by applying concepts of grand strategy to present day issues. Admission is by application only; the cycle for the current year is closed. This course does not fulfill the history seminar requirement, but may count toward geographical distributional credit within the History major for any region studied, upon application to the director of undergraduate studies. Previous study courses in political science, history, global affairs, or subjects with broad interdisciplinary relevance encouraged. HU, SO

* **GLBL 344a / HIST 483Ja / PLSC 161a, Studies in Grand Strategy II** Beverly Gage
The study of grand strategy, of how individuals and groups can accomplish large ends with limited means. During the fall term, students put into action the ideas studied in the spring term by applying concepts of grand strategy to present day issues. Admission is by application only; the cycle for the current year is closed. This course does not fulfill the history seminar requirement, but may count toward geographical distributional credit within the History major for any region studied, upon application to the director of undergraduate studies. Prerequisite: PLSC 321. Previous study courses in political science, history, global affairs, or subjects with broad interdisciplinary relevance encouraged. SO

* **GLBL 346a, Four Conflicts through a Human Rights Lens** Janine di Giovanni
This course focuses on four conflicts of the 1990s—Bosnia, Sierra Leone, Rwanda, and Kosovo—specifically through the lens of human rights. Why are these four conflicts important when other current conflicts—Syria, Yemen, South Sudan—are urgent and pressing? The 1990s was the era of supposed “humanitarian intervention” and “just” wars. Can we learn from what happened in that decade? The course instructor reported extensively on all four conflicts and will use her own on-the-ground knowledge to dig deep into the roots of the conflicts; the specific battles; turning points; the case studies of human rights abuse; and finally, political solutions and post-conflict resolution. SO

* **GLBL 349b / ENGL 240b, Reporting and Writing on War** Janine di Giovanni
This course examines how to identify, interview, and document human rights violations in the field while reporting on war. It is aimed at students who want to work as journalists, advocates or policy makers, or anyone who wants to work as a practitioner during a conflict or humanitarian crisis. The instructor brings her twenty-five years as a field reporter in war zones into the classroom: the goal is to make the learning functional. The course teaches students how to compile their findings in the form of reports and articles for newspapers, magazines as well as advocacy letters, op-eds, and Blogs. We develop skills for “crunching” talking points for presentations and briefing papers. Each week focuses on a theme and links it to a geographical conflict. Students emerge with practical research, writing, and presentation skills when dealing with sensitive human rights material—for instance, victims’ evidence. Course open only to juniors and seniors. SO RP

* **GLBL 355b, The United States, China, and the Origins of the Korean Peninsula Crisis** David Rank

This course looks at the current situation on the Korean Peninsula and the interaction of the major players there through historical and diplomatic practitioners’ perspectives. The strategic interests of major powers intersect on the Korean Peninsula to a degree found in few other places on earth. In a part of the globe China long viewed as within its sphere of influence, four nuclear powers now rub shoulders and the United States

maintains a military presence. With the Armistice that ended the Korean War still in place, Northeast Asia is the Cold War's last front, but today's nuclear crisis makes it more than a historical curiosity. Drawing on original diplomatic documents and other source materials, as well as first-hand experience of current-day diplomats, this course considers the trajectory of the two Korea's relationships with the United States and China and their role in the international politics of East Asia so

*** GLBL 376a / GLBL 552a, Asia Now: Human Rights, Globalization, Cultural Conflicts** Jing Tsu

This course examines contemporary and global issues in Asia (east, southeast, northeast, south), in a historical and interdisciplinary context, that include international law, policy debates, cultural issues, security, military history, media, science and technology, and cyber warfare. Course is co-taught with a guest professor. HU, SO

*** GLBL 381b / PLSC 140b, Military Power** Nuno Monteiro

The foundations, applications, evolution, and limits of military power. Reading of Clausewitz's *On War* in conjunction with contemporary works. Issues include civil-military relations, military power and political influence, coercion, small wars, occupation and insurgency, and the revolution in military affairs. WR, SO

*** GLBL 388a, The Politics of American Foreign Policy** Howard Dean

This seminar addresses the domestic political considerations that have affected American foreign policy in the post-World War II world. The goals of the course are to (1) give historical context to the formation of major existing global governance structures, (2) give students an opportunity to research how major foreign policy decisions in the past were influenced by contemporary political pressure, and (3) assess what effect those pressures have had on today's global issues. Case studies include, but are not limited to: Truman and the Marshall Plan; Johnson and the Vietnam War; Nixon and the opening of China; Reagan and the collapse of the Soviet Union, George HW Bush and Iraq, Clinton and the Balkans, and Obama and the development of a multipolar foreign policy for a multipolar world. so

*** GLBL 390b, Cybersecurity, Cyberwar, and International Relations** Edward Wittenstein

Analysis of international cyberrelations. Topics include cybercrime, cyberespionage, cyberwar, and cybergovernance. Readings from academic and government sources in the fields of history, law, political science, and sociology. WR, SO

GLBL 392a, Intelligence, Espionage, and American Foreign Policy Edward Wittenstein

The discipline, theory, and practice of intelligence; the relationship of intelligence to American foreign policy and national security decision-making. Study of the tools available to analyze international affairs and to communicate that analysis to senior policymakers. Case studies of intelligence successes and failures from World War II to the present.

*** GLBL 398a / HIST 426Ja, Yale and the World: Global Power, Local History** David Engerman

This course uses moments in the history of Yale University to shed light on the forms, functions, and trajectory of U.S. global power from the late 19th century through the early 21st century. Key episodes include missionary work in East Asia,

scientific expeditions in South America, mobilization for war and Cold War, and the internationalization of the student body. Students investigate these episodes by reading scholarly work as well as archival sources, and through discussions with Yale faculty and staff. HU

GLBL 444a / DEVN 198a / EP&E 329a / HIST 122a / PLSC 405a, Power and Politics in Today's World Ian Shapiro

A comparative study of power and politics since the Cold War. Topics include the decline of trade unions and increased influence of business; growing inequality and insecurity; changing attitudes towards democracy and authoritarianism; and the character and durability of the new international order. We start with the impact of the USSR's collapse, both in former communist countries and the West, focusing on reordered relations among business, labor, and governments. Next we take up the Washington Consensus on free trade, privatization, and deregulation, and agendas to fight terrorism, prevent human rights abuses, and spread democracy. Then we turn to the backlash that followed the financial crisis, as technocratic elites lost legitimacy, the global war on terror became mired in quagmires, and humanitarian intervention and democracy-spreading agendas floundered. The new politics of insecurity is our next focus. We examine the populist explosions of 2016 and the politics to which they have given rise. This leads to a consideration of responses, where we discuss the policies most needed when congenial employment insecurity is going to be the norm, and the political reforms that would increase the chances of those policies being adopted. Introductory courses in twentieth-century European, American or global history, comparative politics, or political economy are helpful but are not required. HU, SO

* **GLBL 450a or b, Directed Research** Sigridur Benediktsdottir

Independent research under the direction of a faculty member on a special topic in global affairs not covered in other courses. Permission of the director of undergraduate studies and of the instructor directing the research is required.

* **GLBL 460b, Turning Points in American Foreign Policy** Robert Ford

Examination of American policy decisions and strategies from the founding of the republic to modern day. Topics include American engagement with France and Britain during the American Revolution; post-WWII construction of the modern international order; the breakdown of the Communist system; and the failed states in Yugoslavia and Syria; as well as America's responses to the current challenges of modern world order, emerging multipolarism, and climate change.

* **GLBL 499a, Senior Capstone Project** Staff

Students work in small task-force groups and complete a one-term public policy project under the guidance of a faculty member. Clients for the projects are drawn from government agencies, nongovernmental organizations and nonprofit groups, and private sector organizations in the United States and abroad. Projects and clients vary from year to year. Fulfills the capstone project requirement for the Global Affairs major.

Global Health Studies

Program director, Global Health Studies: Kristina Talbert-Slagle (kristina.talbert-slagle@yale.edu); Global Health Studies Program

GLOBAL HEALTH STUDIES ADVISORY COMMITTEE

Rene Almeling (*Sociology*), Jane Edwards (*Yale College Dean's Office*), Gerald Friedland (*Medicine*), Gregg Gonsalves (*Public Health, Law*), Inderpal Grewal (*Women's, Gender, and Sexuality Studies*), Amy Kapczynski (*Law*), Alice Miller (*Public Health, Law*), Catherine Panter-Brick (*Anthropology*), Joanna Radin (*History of Medicine*), Mark Saltzman (*Biomedical Engineering*), Pam Schirmeister (*Yale College Dean's Office*), Stephen Stearns (*Ecology & Evolutionary Biology*), Kristina Talbert-Slagle (*Public Health*), John Wargo (*Forestry & Environmental Studies*)

GLOBAL HEALTH STUDIES MULTIDISCIPLINARY ACADEMIC PROGRAM

Issues related to health are among the most important challenges facing societies, both domestically and globally. Finding solutions to health-related problems requires multidisciplinary comprehension of all dimensions of health, including biological and social determinants, economics and politics of health care systems and health care delivery, and ways in which health is understood by individuals, societies, and cultures.

The Global Health Studies program facilitates global health education for undergraduates at Yale, offering interdisciplinary courses that bring together the natural sciences, social sciences, and the humanities. The GHS program is designed for students interested in critically and analytically engaging in global health. The program supports students in developing and balancing an appreciation for biomedical and technical issues related to diseases, their treatment and prevention, with an understanding of the historical, social, economic, and political concerns that are implicated in how health is determined and experienced in the twenty-first century. Students choose a major in another department or program and expand their education with courses offered by Global Health Studies.

Although most courses in global health are open to all undergraduates, students desiring greater depth in the field are encouraged to apply to become a Global Health Scholar, typically in the fall of their sophomore year. Global Health Scholars complete an interdisciplinary course of study that includes required and elective course work that supports students in achieving six global health competencies: Biological & Environmental Influences on Health; Health & Societies; Historical Approaches; Performance, Representation & Health; Political Economy & Governance in Health; Understanding & Interpreting Quantitative Data. Moreover, in the summer after junior year, Global Health Scholars pursue an experiential learning project (e.g., internships with NGOs, archival research, field-based projects with faculty, etc.), for which they can receive support in the form of designated funding and mentorship from a global health adviser. During their senior year, students enroll in a colloquium course in which they develop a capstone project that meaningfully integrates their experiential learning project with other skills and knowledge acquired through the GHS program.

To assist students in connecting classroom knowledge and skills with practical work in global health, the Global Health Studies program supports fellowships such as the

Global Health Field Experience Award and the Yale College Fellowships for Research in Global Health Studies.

Qualified students may take graduate courses at the School of Public Health, subject to restrictions on graduate and professional school enrollment described in the Academic Regulations. Further information about these courses and other graduate offerings can be found in the School of Public Health bulletin. For information about the five-year B.A.–B.S./M.P.H. program offered jointly with the School of Public Health, see Public Health.

Students in the Class of 2020, follow the requirements listed below, with the addition of HLTH 240 and two electives (not three), as listed on the Global Health Studies website.

The requirements below apply to students in the Class of 2021 and beyond.

REQUIREMENTS OF THE PROGRAM

Prerequisite None

Number of courses 6 courses (inc senior req)

Specific course required HLTH 230

Distribution of courses 4 electives to achieve the six global health competencies as indicated

Other requirement Experiential learning project the summer after junior year (minimum 8 weeks)

Senior requirement Senior colloquium course (1 semester) and capstone project

Global Health Studies Courses

* **HLTH 081a, Current Issues in Medicine and Public Health** Robert Bazell
Analysis of issues in public health and medicine that get extensive media attention and provoke policy debates. Topics include vaccination, the value of cancer screening and genetic testing, determinants of a healthy lifestyle, the U.S. role in global health, and the cost of health care. Enrollment limited to freshmen with a score of 4 or 5 on the Advanced Placement examination in Biology or the equivalent. Preregistration required; see under Freshman Seminar Program.

HLTH 140b / SOCY 126b, Health of the Public Nicholas Christakis
Introduction to the field of public health. The social causes and contexts of illness, death, longevity, and health care in the United States today. How social scientists, biologists, epidemiologists, public health experts, and doctors use theory to understand issues and make causal inferences based on observational or experimental data. Biosocial science and techniques of big data as applied to health. so

* **HLTH 155a / E&EB 106a / MCDB 106a, Biology of Malaria, Lyme, and Other Vector-Borne Diseases** Alexia Belperron
Introduction to the biology of pathogen transmission from one organism to another by insects; special focus on malaria, dengue, and Lyme disease. Biology of the pathogens including modes of transmission, establishment of infection, and immune responses; the challenges associated with vector control, prevention, development of vaccines, and treatments. Intended for non-science majors; preference to freshmen and sophomores. Prerequisite: high school biology. sc

HLTH 230b / GBLB 223b, Global Health: Challenges and Responses Kristina Talbert-Slagle

Overview of the determinants of health and how health status is measured, with emphasis on low- and middle-income countries. The burden of disease, including who is most affected by different diseases and risk factors; cost-effective measures for addressing the problem. The health of the poor, equity and inequality, and the relationship between health and development. so

* **HLTH 240b / GBLB 193b, Epidemiology and Public Health** Marney White
A general introduction to epidemiology and the field of public health. Methods of epidemiological investigation, research, and practice. Emphasis on study design and the skills necessary for the conduct of mentored field research. Priority to Global Health Fellows.

* **HLTH 250a / E&EB 235a, Evolution and Medicine** Stephen Stearns
Introduction to the ways in which evolutionary science informs medical research and clinical practice. Diseases of civilization and their relation to humans' evolutionary past; the evolution of human defense mechanisms; antibiotic resistance and virulence in pathogens; cancer as an evolutionary process. Students view course lectures on line; class time focuses on discussion of lecture topics and research papers. Prerequisite: BIOL 101-104. WR, SC

* **HLTH 332a / EVST 333a, Climate Change Adaptation and Global Health** Steve Whittaker
Climate change has the observable potential to increase the frequency and intensity of extreme weather events such as hurricanes, heat waves, droughts, frosts, and floods. In response, many concerned citizens, communities, scientific consortia, industries, and governments around the world have sought to adapt to climate change for the sake of global well-being. This course examines climate change adaptation as a risk management strategy; how it builds resilience where there was vulnerability. Health protective activities resulting from thoughtful, interdisciplinary approaches that consider political, commercial, and socio-cultural factors are held as the ideal among all adaptive responses. Scope includes but is not limited to dynamics in the U.S., Latin America, Asia, and the Caribbean. Throughout the semester, participants engage in lectures, discussions, interactive exercises, and collaborative presentations. Enrollment is open to junior and senior undergraduates of Yale University, with preference given to Jackson Institute Global Health Studies Scholars. Non-Global Health Studies Scholars require permission to enroll and should contact the instructor (steve.whittaker@yale.edu) with a brief statement of interest. Cap of 18 students. so

* **HLTH 485b, Global Health Justice: Advocacy, Power, and Change** Alice Miller
This class provides Yale College seniors (with priority given to Global Health Studies Scholars) the opportunity to comprehensively interrogate critical topics at the intersection of global health, policy, and justice with a focus on advocacy as a tool, and health equity as a goal. Through a weekly seminar (with readings, case studies, guest lectures, and seminar-style discussion), students develop the knowledge and tools to engage critically and constructively with the ideas and practices constituting advocacy, movement-building, and policy-making in global health, and work to develop a capstone project in which they explore and/or present various forms of policy development, strategic advocacy, and/or claims-making in global health. Course readings and approaches draw from human rights, public health, historical,

anthropological, and other critical frames in order to introduce students to the multiple lenses through which questions of global health justice can be addressed. This course is designed to encompass diverse disciplinary perspectives and approaches: final products can be theoretically focused or analytic papers, strategic development/arguments for policy development and/or assessment of historical or archival research. This course is a requirement for all Global Health Studies Scholars who are graduating seniors and who did not complete HLTH 490 in Fall 2018. Yale College seniors who are not Global Health Studies Scholars but who have significant interest and prior coursework in global health, as well as ideas for a final project, can write to the instructors sharing their relevant background and requesting permission to enroll. Cap of 15 students SO

* **HLTH 490a, Global Health Research Colloquium** Leslie Curry

This course is designed for Yale College seniors or graduate students who are synthesizing data from global health fieldwork and preparing manuscripts that are suitable for submission to a peer-reviewed journal. Enrollment is limited to 18, and preference will be given to Global Health Fellows. The course meets weekly, but the format of individual course sessions changes as described in detail in the syllabus. Students will receive one-on-one instruction and mentorship from one of the course professors, participate in peer-review in small work groups, give a research-in-progress presentation, and develop a manuscript suitable for publication in a peer-reviewed journal. Priority will be given to Global Health Fellows. Students must have completed global health fieldwork. RP

Related Courses

* **ANTH 451b / WGSS 431b, Intersectionality and Women's Health** Marcia Inhorn

The intersections of race, class, gender, and other axes of “difference” and their effects on women’s health, primarily in the contemporary United States. Recent feminist approaches to intersectionality and multiplicity of oppressions theory. Ways in which anthropologists studying women’s health issues have contributed to social and feminist theory at the intersections of race, class, and gender. SO

* **BENG 405b / EVST 415b, Biotechnology and the Developing World** Anjelica Gonzalez

Study of technological advances that have global health applications. Ways in which biotechnology has enhanced quality of life in the developing world. The challenges of implementing relevant technologies in resource-limited environments, including technical, practical, social, and ethical aspects. Prerequisite: MCDB 120, or BIOL 101 and 102.

ECON 170a, Health Economics and Public Policy Howard Forman

Application of economic principles to the study of the U.S. health care system. Emphasis on basic principles about the structure of the U.S. system, current problems, proposed solutions, and the context of health policy making and politics. After introductory microeconomics. SO

ECON 325b / EP&E 321b / SAST 281b, Economics of Developing Countries: Focus on South Asia Zachary Barnett-Howell

Analysis of current problems of developing countries. Emphasis on the role of economic theory in informing public policies to achieve improvements in poverty and inequality, and on empirical analysis to understand markets and responses to poverty. Topics

include microfinance, education, health, agriculture, intrahousehold allocations, gender, and corruption. Prerequisites: introductory microeconomics and introductory econometrics. SO

* **EVST 261a / F&ES 261a / G&G 261a, Minerals and Human Health** Ruth Blake
Study of the interrelationships between Earth materials and processes and personal and public health. The transposition from the environment of the chemical elements essential for life. After one year of college-level chemistry or with permission of instructor; G&G 110 recommended. SC

* **GLBL 306a / AFST 306a, Social Enterprise in Developing Economies II** Robert Hopkins

Summer research developed into a case-study project on a topic related to the use of social enterprise in regional economic development. GLBL 305

HSHM 215a / HIST 140a, Public Health in America, 1793 to the Present Naomi Rogers

A survey of public health in America from the yellow fever epidemic of 1793 to AIDS and breast cancer activism at the end of the past century. Focusing on medicine and the state, topics include quarantines, failures and successes of medical and social welfare, the experiences of healers and patients, and organized medicine and its critics. HU

* **MCDB 050a, Immunology and Microbes** Paula Kavathas

Introduction to the immune system and its interaction with specific microbes. Attention both to microbes that cause illness, such as influenza, HIV, and HPV, and to microbes that live in harmony with humans, collectively called the microbiome. Readings include novels and historical works on diseases such as polio and AIDS. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program.

SC RP

MCDB 290b, Microbiology John Wertz and Murat Acar

Cell structure of bacteria, bacterial genetics, microbial evolution and diversity, bacterial development, microbial interaction, chemotaxis and motility, gene regulation, microbial genomics and proteomics, CRISPR, metabolism, infectious diseases, mechanisms of pathogenesis, host defense systems, viruses, gut microbiota in health and disease. Prerequisites: BIOL 101, 102, and 103, or equivalent performance on the corresponding biological sciences placement examinations; or one term of biochemistry, or cell biology, or genetics; or with permission of instructor. SC

PLSC 257b, Bioethics and Law Stephen Latham

The treatment by American law of major issues in contemporary biomedical ethics: informed consent, assisted reproduction, abortion, end-of-life care, research on human subjects, stem cell research, and public health law. Readings include legal cases, statutes, and regulations. No background in law assumed. SO

[**PSYC 355, Clinical Psychology in the Community**]

Hellenic Studies

Chair: John Geanakoplos (john.geanakoplos@yale.edu), 30 Hillhouse Ave., 432-3397; **Director:** George Syrimis (george.syrimis@yale.edu), 34 Hillhouse Ave., 432-9342; <http://hsp.macmillan.yale.edu>

Hellenic Studies is a program of the European Studies Council. The core of the program is the teaching of modern Greek, supplemented with other courses and events related to the study of postantiquity Greece, as well as the society and culture of modern Greece and its interaction with the rest of Europe and the world. Related courses can be found in the listings of Anthropology, History, History of Art, Literature, Political Science, Religious Studies, and Russian and East European Studies. A major in Ancient and Modern Greek is described under Classics. Students who have an interest in postantiquity Greek language, society, or culture are advised to consult with the program administrator of the Hellenic Studies program.

FACULTY ASSOCIATED WITH THE PROGRAM OF HELLENIC STUDIES

Professor John Geanakoplos (*Economics*)

Lecturers Paris Aslanidis, George Syrimis

Senior Lector Maria Kaliambou

Courses

MGRK 110a, Elementary Modern Greek I Maria Kaliambou

An introduction to modern Greek, with emphasis on oral expression. Use of communicative activities, graded texts, written assignments, grammar drills, audiovisual material, and contemporary documents. In-depth cultural study. L1
1½ Course cr

MGRK 120b, Elementary Modern Greek II Maria Kaliambou

Continuation of MGRK 110. Prerequisite: MGRK 110. L2 1½ Course cr

* **MGRK 130a, Intermediate Modern Greek I** Maria Kaliambou

Further development of oral and written linguistic skills, using authentic readings and audiovisual materials. Continued familiarization with contemporary Greek culture. Prerequisite: MGRK 120 or equivalent. L3 1½ Course cr

* **MGRK 140b, Intermediate Modern Greek II** Maria Kaliambou

Further development of listening, speaking, reading, and writing skills in modern Greek. Presentation of short research projects related to modern Greece. Prerequisite: MGRK 130 or equivalent. L4 1½ Course cr

* **MGRK 151a, Advanced Modern Greek** Maria Kaliambou

Advanced language course intended to further develop reading, writing, speaking, and listening skills, while sharpening students' sensitivity toward modern Greek culture. MGRK 140 or permission of instructor. L5

* **MGRK 216a / CLCV 216a / LITR 239a / WGSS 209a, Dionysus in Modernity**

George Syrimis

Modernity's fascination with the myth of Dionysus. Questions of agency, identity and community, and psychological integrity and the modern constitution of the self. Manifestations of Dionysus in literature, anthropology, and music; the Apollonian-

Dionysiac dichotomy; twentieth-century variations of these themes in psychoanalysis, surrealism, and magical realism. HU TR

* **MGRK 218a / FILM 243a / WGSS 245a, Family in Greek Literature and Film**

George Syrimis

The structure and multiple appropriations of the family unit, with a focus on the Greek tradition. The influence of aesthetic forms, including folk literature, short stories, novels, and film, and of political ideologies such as nationalism, Marxism, and totalitarianism. Issues related to gender, sibling rivalry, dowries and other economic factors, political allegories, feminism, and sexual and social violence both within and beyond the family. WR, HU TR

* **MGRK 222b / HIST 237Jb, History of Modern Greece** Staff

This seminar studies the history of modern Greece since the early 19th century. Greece's contested position between East and West, both geopolitically and symbolically, functions as the ideational backdrop for the study of the country's historical trajectory and the development of its main institutions. Discussion of the future of the Greek state vis-à-vis the ongoing sociopolitical crisis it has been facing since its near bankruptcy in 2010 is also considered. HU

* **MGRK 300b / CLCV 319b / HIST 242Jb / WGSS 293b, The Olympic Games, Ancient and Modern** George Syrimis

Introduction to the history of the Olympic Games from antiquity to the present. The mythology of athletic events in ancient Greece and the ritual, political, and social ramifications of the actual competitions. The revival of the modern Olympic movement in 1896, the political investment of the Greek state at the time, and specific games as they illustrate the convergence of athletic cultures and sociopolitical transformations in the twentieth century. HU

* **MGRK 304b / ER&M 376b / PLSC 376b / SOCY 307b, Extreme and Radical Right Movements** Paris Aslanidis

Extreme and radical right movements and political parties are a recurrent phenomenon found in most parts of the world. Discussion of their foundational values and the causes of their continuous, even increasing, support among citizens and voters. SO

History

Director of undergraduate studies: Edward Rugemer (edward.rugemer@yale.edu), Rm. 415, 1037 Chapel St., 436-3556; history.yale.edu

The History major is for students who understand that shaping the future requires knowing the past. History courses explore many centuries of human experimentation and ingenuity, from the global to the individual scale. History majors learn to be effective storytellers and analysts, and to craft arguments that speak to broad audiences. They make extensive use of Yale's vast library resources to create pioneering original research projects. Students of history learn to think about politics and government, sexuality, the economy, cultural and intellectual life, war and society, and other themes in broadly humanistic—rather than narrowly technocratic—ways.

History is one of Yale College's most popular and intellectually diverse majors, encompassing nearly every region and time period of the global past. The study of history is excellent preparation for careers in many fields, including law, journalism, business and finance, education, politics and public policy, social activism, and the arts.

COURSE NUMBERING

Courses numbered HIST 001 to 099 are first-year seminars, with enrollment limited to eighteen. Remaining course numbers are organized by region, not by rigor or difficulty. Courses numbered in the 100s explore the history of the United States or Canada; those in the 200s, Europe, Russia, and Britain; and those in the 300s, Africa, Asia, Latin America, and the Middle East. Courses numbered in the 400s address global topics. Courses whose numbers end with the letter "J" are departmental seminars; all departmental seminars are available for preregistration by History majors and are capped at fifteen students.

PREREQUISITE

The prerequisite for the major is two term courses in History. Courses completed in fulfillment of the prerequisite may be applied toward the requirements of the major.

REQUIREMENTS OF THE MAJOR

Ten term courses in History are required, including prerequisites, and in addition to the senior essay.

Upon declaration, all History majors select either the global or the specialist track. The global track is designed for students seeking a broad understanding of major trends in the history of human societies throughout the world. The specialist track is for students seeking to focus in a particular geographic region, such as the United States, or in a thematic pathway, such as empires and colonialism. Majors may change tracks until the end of the course selection period in the second term of the junior year.

The global track requires one course in each of five different geographic regions (see below). Students must also take two preindustrial courses, covering material before the year 1800, and two departmental seminars, identified by a "J" suffix to the course number (e.g., HIST 140J).

The specialist track requires at least five (and up to eight) courses in a particular geographic region or in a thematic pathway (see list below). Courses appropriate for

each region and pathway are listed on the department website. Students must also take at least two courses outside their area of specialization, and their overall course work must include at least three geographic regions. Like students in the global track, students in the specialist track must take two preindustrial courses, covering material before the year 1800, and at least two departmental seminars, identified by a "J" suffix to the course number (e.g. HIST 140J). Students in the specialist track may design an area of specialization with the approval of a faculty adviser and the director of undergraduate studies (DUS).

Regions: United States; Europe; Latin America; Asia; Middle East and Africa.

Pathways: cultural history; empires and colonialism; environmental history; ideas and intellectuals; international history; politics and law; race, gender, and sexuality; religion in context; science, technology, and medicine; social change and social movements; war and society; the world economy.

Students in either track may count the same courses toward geographical, preindustrial, and seminar requirements. For instance, a departmental seminar on premodern Japan simultaneously fulfills the preindustrial, seminar, and Asia geographical requirements.

Departmental seminars All students who declare the History major are entitled to preregister for two departmental seminars (designated by a course number ending in J, such as HIST 140J). Many seminars are popular and fill up quickly. Students may use their preregistration privileges at any time after declaring the major, in their sophomore, junior, or senior years. Sophomores contemplating study abroad are urged to consider taking at least one seminar in the sophomore year. Residential college seminars, study-abroad courses, and courses in other departments that count toward the History major do not fulfill the departmental seminar requirement.

Distinction in the major Students who receive an A or A- on the two-term senior essay and who receive the requisite grades in their remaining course work are awarded Distinction in the Major. (See under Undergraduate Curriculum, Honors. Students who do not complete the two-term senior essay are not eligible for Distinction.

Credit/D/Fail Departmental seminars cannot be taken Credit/D/Fail.

Roadmap See visual roadmap of the requirements.

SENIOR REQUIREMENT

Students in the History major are not passive consumers of historical knowledge: they create original works of history themselves. As seniors, History majors complete a work of original research in close consultation with a faculty adviser. The range of acceptable topics and methodological approaches is wide. The aim is to take on study of a significant historical subject through research in accessible primary source materials.

Most students choose to write a two-term independent senior essay, for two course credits toward the major. The two-term essay is required to earn Distinction in the Major. A smaller number of students choose to write an independent one-term senior essay, for one course credit toward the major.

The one-term senior essay History majors may choose to write a one-term independent senior essay during the fall term under the guidance of a faculty adviser; however, students who choose the one-term option are not eligible for Distinction

in the Major or history prizes. The one-term essay is a substantial research paper (roughly half the length of the two-term senior essay) based on primary sources, along with a bibliographic essay. Seniors receive course credit for their departmental essays by enrolling in HIST 497 during the fall of senior year. In rare circumstances, with permission of the adviser and Senior Essay Director, a student enrolled in HIST 497 during the fall term may withdraw from the course in accordance with Yale College regulations on course withdrawal and enroll in HIST 497 during the spring term. Additional details about the senior essay are provided in the Senior Essay Handbook, available on the History website.

The two-term senior essay History majors seeking to earn Distinction in the Major must complete a two-term independent senior essay under the guidance of a faculty adviser. The typical senior essay is 40–50 pages (no more than 12,500 words), plus a bibliography and bibliographical essay. Seniors receive course credit for their departmental essays by enrolling in HIST 495 (first term of senior year) and HIST 496 (second term of senior year). The grade for the final essay, determined by an outside reader in consultation with the faculty adviser, is applied retroactively to both terms. Additional details about the senior essay are provided in the Senior Essay Handbook, available on the History website. History majors graduating in December may begin their two-term senior essay in the spring term and complete the senior essay during fall term.

Additional option for the senior essay Some students embark on the two-term essay but discover that their choice is not a good fit. Students who enroll in HIST 495 during the first term may opt out in consultation with their faculty adviser and the senior essay director. This decision must be made in accordance with Yale College regulations on course withdrawal. Instead, the student will enroll in HIST 497 in the spring term to write a one-term senior essay. Students who opt out will not be eligible for Distinction in the Major or History prizes. Additional details about the senior essay are provided in the Senior Essay Handbook, available on the History website.

ADVISING

All students who declare the History major are assigned an adviser from among the departmental faculty. The adviser is available throughout the year for consultation about courses and the major. Students in the global track are assigned an adviser from the general History faculty. Students in the specialist track are assigned an adviser in their area of specialization. At the beginning of each term, students majoring in History must have their schedule signed and approved by their departmental adviser or by the DUS. Students may request a specific adviser in consultation with the DUS, though the department cannot always accommodate such requests.

Course substitution History majors are permitted to include up to two courses taught outside the department toward fulfillment of the major, with the approval of the DUS. Nondepartmental courses may fulfill geographic, region/pathway, and preindustrial distribution requirements. They may not fulfill departmental seminar or senior requirements.

Combined B.A./M.A. degree program Exceptionally able and well-prepared students may complete a course of study leading to the simultaneous award of the B.A. and M.A. degrees after eight terms of enrollment. See Academic Regulations, section K,

Special Arrangements, "Simultaneous Award of the Bachelor's and Master's Degrees." Interested students should consult the DUS prior to the sixth term of enrollment for specific requirements in History.

REQUIREMENTS OF THE MAJOR

Prerequisites 2 term courses in History

Number of courses 10 term courses (incl prereqs, not incl senior essay)

Distribution of courses *Both tracks*—2 courses in preindustrial hist as specified; 2 departmental sems; *Global track*—1 course in each of 5 geographical regions (U.S., Europe, Latin America, Asia, Africa/Middle East); *Specialist track*—at least 5 courses in specific region or pathway; at least 2 courses outside region or pathway; overall course work must include 3 regions

Substitution permitted 1 or 2 nondepartmental courses approved by DUS

Senior requirement Two-term senior essay (HIST 495 and 496) or one-term senior essay (HIST 497)

FACULTY OF THE DEPARTMENT OF HISTORY

Professors Abbas Amanat, Ned Blackhawk, David Blight, Daniel Botsman, Paul Bushkovitch, Deborah Coen, Carolyn Dean, Fabian Drixler, Carlos Eire, David Engerman, Paul Freedman, Joanne Freeman, John Gaddis, Beverly Gage, Bruce Gordon, Valerie Hansen, Robert Harms, Matthew Jacobson, Gilbert Joseph, Paul Kennedy, Benedict Kiernan, Jennifer Klein, Naomi Lamoreaux, Bentley Layton, Noel Lenski, Kathryn Lofton, Mary Lui, Daniel Magaziner, Joseph Manning, Ivan Marcus, John Merriman, Joanne Meyerowitz, Alan Mikhail, Samuel Moyn, Nicholas Parrillo, Peter Perdue, Mark Peterson, Stephen Pitti, Naomi Rogers, Paul Sabin, Stuart Schwartz, Timothy Snyder, David Sorkin, Harry Stout, John Warner, Anders Winroth, John Witt, Keith Wrightson

Associate Professors Paola Bertucci, Crystal Feimster, Andrew Johnston, Joanna Radin, Edward Rugemer, Marci Shore, Eliyahu Stern

Assistant Professors Jennifer Allen, Sergei Antonov, Rohit De, Marcela Echeverri, Anne Eller, Denise Ho, Isaac Nakhimovsky, William Rankin, Carolyn Roberts, Jonathan Wytzen

Senior Lecturers Becky Conekin, Jay Gitlin, Stuart Semmel, Rebecca Tannenbaum

Lecturers Sakena Abedin, Laurne Banko, Ivano Dal Prete, Rachel Elder, Jay Gitlin, Ian Johnson, Maria Jordan, George Levesque, Chitra Ramalingam, Terence Renaud, Travis Ross

First-Year Seminars

* **HIST 006b / HSHM 005b, Medicine and Society in American History** Rebecca Tannenbaum

Disease and healing in American history from colonial times to the present. The changing role of the physician, alternative healers and therapies, and the social impact of epidemics from smallpox to AIDS. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **HIST 012b / AMST 012b, Politics and Society in the United States after World War II** Jennifer Klein

Introduction to American political and social issues from the 1940s to the present, including political economy, civil rights, class politics, and gender roles. Legacies of the New Deal as they played out after World War II; the origins, agenda, and ramifications of the Cold War; postwar suburbanization and its racial dimensions; migration and immigration; cultural changes; social movements of the Right and Left; Reaganism and its legacies; the United States and the global economy. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU

* **HIST 017a, American Indians in Higher Education: Introduction to the Indigenous History of American Education** Ned Blackhawk

Education remains an essential element in Native American history, a complex arena full of conflict, resistance, adaptation, and social change. Charting the centuries-long relationships between Native Americans and Euro-American institutions of higher education, this seminar seeks to expose students to the educational history of Native North America. Through in-class assignments, discussion, and sets of experiential campus and off-campus tours, this class both introduces the educational history of Native North America and links it with the broader political history of federal Indian law and policy. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

* **HIST 020b / ARCG 031b / CLCV 059b / EVST 030b / NELC 026b, Rivers and Civilization** Harvey Weiss

The appearance of the earliest cities along the Nile and Euphrates in the fourth millennium B.C. Settlements along the rivers, the origins of agriculture, the production and extraction of agricultural surpluses, and the generation of class structures and political hierarchies. How and why these processes occurred along the banks of these rivers; consequent societal collapses and their relation to abrupt climate changes. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU, SO

* **HIST 022a, What History Teaches** John Gaddis

An introduction to the discipline of history. History viewed as an art, a science, and something in between; differences between fact, interpretation, and consensus; history as a predictor of future events. Focus on issues such as the interdependence of variables, causation and verification, the role of individuals, and to what extent historical inquiry can or should be a moral enterprise. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

* **HIST 033a / WGSS 033a, Fashion in London and Paris, 1750 to the Present** Becky Conekin

Introduction to the history of Western fashion from the mid-eighteenth century to the present, with a focus on Paris and London. Approaches, methods, and theories scholars have historically employed to study fashion and dress. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

* **HIST 034b, Cuba from Slavery to Revolution** Anne Eller

Cuba's rich history from the early colonial period to the present. Topics include colonialism, slavery, independence, emancipation, the Cuban Revolution, and

the nation's relationship with the United States. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **HIST 037a / CLCV 034a / HSHM 002a, Medicine and Disease in the Ancient World**

Jessica Lamont

Examination of ancient medicine considering modern fields of pathology, surgery, pharmacology, therapy, obstetrics, psychology, anatomy, medical science, ethics, and education, to gain a better understanding of the foundations of Western medicine and an appreciation for how medical terms, theories, and practices take on different meanings with changes in science and society. All readings in English. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.

HU

* **HIST 055b, A History of Modern London** Becky Conekin

Chronological and thematic exploration of modern London as a metropolitan and imperial center from the late-nineteenth-century to the present day. Topics include race, gay rights, women's rights, consumer culture, the experience of war, and the development of a multi-racial society. The fashion, food, and popular music of London emerge as important components of the city's global identity in the twentieth century. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

* **HIST 072a, The History of World History** Valerie Hansen

How the great historians of ancient Greece, Rome, China, the Islamic world, and nineteenth-century Europe created modern historical method. How to evaluate the reliability of sources, both primary and secondary, and assess the relationship between fact and interpretation. Using historical method to make sense of our world today. Strategies for improving reading, writing, and public speaking skills. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

* **HIST 078b, Truth and Post-Truth** Marci Shore

This European intellectual history seminar explores the epistemological question in philosophy: does the world really exist? How do I know it's really there and not just a projection of my consciousness? is there such a thing as truth? We begin with European philosophy, moving through Descartes, Kant and Husserl and through the role of ideology and lies in 20th century totalitarianism, then to dissident thought in Eastern Europe in the 1970s and 1980s, and finally to the emergence of "post-truth" in the 20th century and its implications in both philosophy and life. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

Lecture Courses

HIST 101a, The World Circa 1000 Valerie Hansen and Anders Winroth

A study of the world's major societies and the encounters among them circa 1000, when globalization began. Attention to China, India, Europe, the Vikings, Africa, the Islamic world, Amerindians including the Maya. Analysis of written and archaeological sources.

HU

HIST 115a / AMST 188a, The Colonial Period of American History Staff

This course explores the history of North America from the period of European colonization through the era of the Seven Years' War, from roughly 1492 to 1763.

Emphasis is placed on the migration of people from Europe and Africa to North America; their contact and interaction with Native Americans; the formation of new societies and economies; and the corresponding development of new political and social ideas in America, with special attention paid to the evolving relationship between slavery and freedom. Although the course addresses the major themes and issues of early American history, the lectures and readings frequently focus on the lives of individuals, both prominent and obscure, who shaped and were shaped by larger forces and developments. HU

HIST 119b / AFAM 172b, The Civil War and Reconstruction Era, 1845–1877 David Blight

The causes, course, and consequences of the American Civil War. A search for the multiple meanings of a transformative event, including national, sectional, racial, constitutional, social, gender, intellectual, and individual dimensions. HU

HIST 122a / DEVN 198a / EP&E 329a / GBL 444a / PLSC 405a, Power and Politics in Today's World Ian Shapiro

A comparative study of power and politics since the Cold War. Topics include the decline of trade unions and increased influence of business; growing inequality and insecurity; changing attitudes towards democracy and authoritarianism; and the character and durability of the new international order. We start with the impact of the USSR's collapse, both in former communist countries and the West, focusing on reordered relations among business, labor, and governments. Next we take up the Washington Consensus on free trade, privatization, and deregulation, and agendas to fight terrorism, prevent human rights abuses, and spread democracy. Then we turn to the backlash that followed the financial crisis, as technocratic elites lost legitimacy, the global war on terror became mired in quagmires, and humanitarian intervention and democracy-spreading agendas floundered. The new politics of insecurity is our next focus. We examine the populist explosions of 2016 and the politics to which they have given rise. This leads to a consideration of responses, where we discuss the policies most needed when congenial employment insecurity is going to be the norm, and the political reforms that would increase the chances of those policies being adopted. Introductory courses in twentieth-century European, American or global history, comparative politics, or political economy are helpful but are not required. HU, SO

HIST 135b / ECON 182b, American Economic History Naomi Lamoreaux

The growth of the American economy since 1790, both as a unique historical record and as an illustration of factors in the process of economic development. The American experience viewed in the context of its European background and patterns of industrialization overseas. After introductory microeconomics. WR, SO

HIST 141a / AMST 141a, The American West Travis Ross

The history of the American West as both frontier and region, real and imagined, from the first contacts between Indians and Europeans in the fifteenth century to the multicultural encounters of the contemporary Sunbelt. Students work with historical texts and images from Yale's Western Americana Collection. HU

HIST 140a / HSHM 215a, Public Health in America, 1793 to the Present Naomi Rogers

A survey of public health in America from the yellow fever epidemic of 1793 to AIDS and breast cancer activism at the end of the past century. Focusing on medicine and the

state, topics include quarantines, failures and successes of medical and social welfare, the experiences of healers and patients, and organized medicine and its critics. HU

HIST 184a / AFAM 160a / AFST 184a / AMST 160a, The Rise and Fall of Atlantic Slavery Edward Rugemer

The history of peoples of African descent throughout the Americas, from the first African American societies of the sixteenth century through the century-long process of emancipation. HU

HIST 187b / AFAM 162b / AMST 162b, African American History from Emancipation to the Present Staff

An examination of the African American experience since 1861. Meanings of freedom and citizenship are distilled through appraisal of race and class formations, the processes and effects of cultural consumption, and the grand narrative of the civil rights movement. WR, HU

HIST 199a / AMST 236a / EVST 318a / HSHM 207a, American Energy History Paul Sabin

The history of energy in the United States from early hydropower and coal to present-day hydraulic fracturing, deepwater oil, wind, and solar. Topics include energy transitions and technological change; energy and democracy; environmental justice and public health; corporate power and monopoly control; electricity and popular culture; labor struggles; the global quest for oil; changing national energy policies; the climate crisis. HU

HIST 202a, European Civilization, 1648–1945 John Merriman

An overview of the economic, social, political, and intellectual history of modern Europe. Topics include the rise of absolute states, the scientific revolution, the Enlightenment, the French Revolution and Napoleon, the industrial revolution, the revolutions of 1848, nationalism and national unifications, Victorian Britain, the colonization of Africa and Asia, fin-de-siècle culture and society, the Great War, the Russian Revolution, the Europe of political extremes, and World War II. HU

HIST 205b / CLCV 205b / HUMS 143b, Introduction to Ancient Greek History Jessica Lamont

Introduction to Greek history, tracing the development of Greek civilization as manifested in the political, military, intellectual, and creative achievements from the Bronze Age through the end of the Classical period. Students read original sources in translation as well as secondary scholarship to better understand the rise and fall of the ancient Greeks—the civilization at the very heart of Western Civilization. HU

HIST 211b, The Birth of Europe, 1000–1500 Paul Freedman

Europe during the central and late Middle Ages, from the feudal revolution to the age of discoveries. Europe as it came to be defined in terms of national states and international empires. The rise and decline of papal power, church reform movements, the Crusades, contacts with Asia, the commercial revolution, and the culture of chivalry. HU

HIST 217a / CLCV 206a / HUMS 144a, The Roman Republic Andrew Johnston

The origins, development, and expansion of Rome from the earliest times to the deaths of Caesar and Cicero. Cultural identity and interaction; slavery, class, and the family; politics, rhetoric, and propaganda; religion; imperialism; monumentality and memory;

and the perception and writing of history. Application of literary and archaeological evidence. HU

HIST 218b / CLCV 207b, The Roman Empire Andrew Johnston

The history of the Roman Empire from its establishment by Augustus to the reign of Justinian. Attention to social, intellectual, and religious changes, as well as to the framework of historical events within which these changes took place, and to the processes by which the Roman Empire was replaced by the institutions of the Western Middle Ages and the Byzantine Empire. HU

HIST 225b / CLCV 236b, Roman Law Noel Lenski

Basic principles of Roman law and their applications to the social and economic history of antiquity and to the broader history of international law. Topics include the history of persons and things, inheritance, crime and tort, and legal procedure. Questions of social and economic history and the history of jurisprudence from the fifth century B.C.E. to the present. HU

* **HIST 227a / SPAN 367a, The Spanish Civil War: Words and Images** Noël Valis
An introduction to the history and cultural-literary impact of the Spanish Civil War (1936–39) from national and international perspectives. Views both from within and from outside the war; women and the war; memory and the war. Authors include George Orwell, Ernest Hemingway, Javier Cercas, Alberto Méndez, Mercè Rodoreda, Ramón J. Sender, W. H. Auden, and Stephen Spender. Open to students who have placed into L5 courses or who have successfully completed an L4 course in Spanish. Counts toward the Spanish major. L5, HU

HIST 228b, Vikings Anders Winroth

Introduction to the history, literature, and culture of Scandinavia between 700 and 1250. Viking raids, skaldic and eddic poetry, Icelandic sagas, and northern myths; runestones, ships, halls, and swords in literature and history; Viking women, northern trade, colonization, Christianization, and Viking landings in America. HU

HIST 229a, From Oligarchy to Democracy in Britain, 1780–1914 Stuart Semmel

British politics, society, and culture in the long nineteenth century, a period of constitutional reform, industrial development, social dislocation, imperial expansion, and cultural criticism. HU

* **HIST 230b, Twentieth-Century Jewish Political History: Holocaust, Israel, American Jewry** David Sorkin

This course studies Jewish political behavior in response to three key developments of the twentieth century that directly impinged upon Jews: Nazi totalitarianism resulted in the mass murder of Jews, de-colonization resulted in the Jews' return to sovereignty with the establishment of the State of Israel, and the development America's post-war "open" society of equality resulted in American Jewry flourishing in perhaps unprecedented ways. This course aims to study the vexed question of Jews' political behavior in response to these twentieth-century developments. Students write essays about the three events and have the opportunity to undertake original research about one of them. HU

HIST 231b / HUMS 277b, What was Enlightenment? Isaac Nakhimovsky

A survey of eighteenth-century European intellectual life, considered in its social and cultural contexts and with attention to its historical legacies, focusing on responses to emerging global networks of trade, finance, and empire. HU

HIST 239b, Britain's Empire since 1763 Stuart Semmel

The varieties of rule in different parts of Britain's vast empire, from India to Africa to the West Indies. Ways in which events in one region could redirect policy in distant ones; how British observers sought to reconcile empire's often authoritarian nature with liberalism and an expanding democracy at home; the interaction of economic, cultural, political, and environmental factors in shaping British imperial development. HU

HIST 241b, European Political Thought from Machiavelli to Marx Staff

Survey of European political thought from the Renaissance to the age of revolutions. Humanism and the philosophical systems of natural rights that emerged from it; use of these systems as a framework for major political debates of the eighteenth and early nineteenth centuries. Readings include texts by Machiavelli, Hobbes, Locke, Rousseau, Kant, and Marx. HU

HIST 246b / EVST 189b, The History of Food Paul Freedman

The history of food and culinary styles from prehistory to the present, with a particular focus on Europe and the United States. How societies gathered and prepared food. Changing taste preferences over time. The influence of consumers on trade, colonization, and cultural exchange. The impact of colonialism, technology, and globalization. The current food scene and its implications for health, the environment, and cultural shifts. HU

HIST 249a / JDST 346a, Making European Culture Jewish: Five Media, 1780-1930

David Sorkin

This course studies the ways in which Jewish writers and artists turned European culture into Jewish culture, that is, how a minority group fashioned its own version of the majority culture. As European Jews encountered European culture and society, they had to grapple with a host of fundamental questions. What was Judaism and who were the Jews: a religion, a history, a culture, a nation? We examine the way in which writers and artists struggled with these issues in five media: memoir, theology, history, fiction, and painting, thereby creating Jewish versions first of Enlightenment, Romanticism, and realism (1780-1870) and then of nationalism, positivism, and modernism (1870-1930). HU

HIST 254a / GMAN 208a, Germany from Unification to Refugee Crisis Jennifer Allen

The history of Germany from its unification in 1871 through the present. Topics include German nationalism and national unification; the culture and politics of the Weimar Republic; National Socialism and the Holocaust; the division of Germany and the Cold War; the Student Movement and New Social Movements; reunification; and Germany's place in contemporary Europe. HU

HIST 263a, Eastern Europe to 1914 Timothy Snyder

Eastern Europe from the medieval state to the rise of modern nationalism. The Ottoman Empire, the Polish-Lithuanian Commonwealth, the Hapsburg monarchy, and various native currents. Themes include religious diversity, the constitution of empire, and the emergence of secular political ideologies. HU

HIST 264b / RSEE 268b, Eastern Europe since 1914 Staff

Eastern Europe from the collapse of the old imperial order to the enlargement of the European Union. Main themes include world war, nationalism, fascism, and communism. Special attention to the structural weaknesses of interwar nation-states and postwar communist regimes. Nazi and Soviet occupation as an age of extremes. The collapse of communism. Communism after 1989 and the dissolution of Yugoslavia in the 1990s as parallel European trajectories. HU

HIST 271a / HUMS 339a / RSEE 271a, European Intellectual History since Nietzsche

Marci Shore

Major currents in European intellectual history from the late nineteenth century through the twentieth. Topics include Marxism-Leninism, psychoanalysis, expressionism, structuralism, phenomenology, existentialism, antipolitics, and deconstruction. HU

HIST 275a, Revolutionary France, 1789–1871 John Merriman

Dimensions of political, social, and economic change in France during its most turbulent period. The causes and impact of the revolutions of 1789, 1830, 1848, and 1871; demographic change and large-scale industrialization; shifting political elites, republican and socialist alternatives to monarchy, and urbanization. HU

HIST 276b, France since 1871 John Merriman

The emergence of modern France since the Paris Commune of 1871 and the beginnings of the Third Republic. The social, economic, political, and cultural transformation of France; the impact of France's revolutionary heritage, of industrialization, and of the dislocation wrought by two world wars and decolonialization; and the political response of the Left and the Right to changing French society, including the impact of immigration and the emergence and challenges of the European Union. One discussion section conducted in French; students in this section may count the course toward the French major. HU

HIST 280a / ITAL 315a / RLST 160a, The Catholic Intellectual Tradition Carlos Eire

Introductory survey of the interaction between Catholicism and Western culture from the first century to the present, with a focus on pivotal moments and crucial developments that defined both traditions. Key beliefs, rites, and customs of the Roman Catholic Church, and the ways in which they have found expression; interaction between Catholics and the institution of the Church; Catholicism in its cultural and sociopolitical matrices. Close reading of primary sources. HU

HIST 281b / RLST 268b, Christian Mysticism, 1200–1700 Carlos Eire

An introductory survey of the mystical literature of the Christian West, focusing on the late medieval and early modern periods. Close reading of primary texts, analyzed in their historical context. HU

HIST 290a / RSEE 225a, Russia from the Ninth Century to 1801 Paul Bushkovitch

The mainstream of Russian history from the Kievan state to 1801. Political, social, and economic institutions and the transition from Eastern Orthodoxy to the Enlightenment. HU

HIST 303b, Japan's Modern Revolution Daniel Botsman

A survey of Japan's transformation over the course of the nineteenth century from an isolated, traditional society on the edge of northeast Asia to a modern imperial power. Aspects of political, social, and cultural history. HU

HIST 307b / EAST 301b, The Making of Japan's Great Peace, 1550–1850 Fabian Drixler

Examination of how, after centuries of war in Japan and overseas, the Tokugawa shogunate built a peace that lasted more than 200 years. Japan's urban revolution, the eradication of Christianity, the Japanese discovery of Europe, and the question of whether Tokugawa Japan is a rare example of a complex and populous society that achieved ecological sustainability. HU

HIST 311a / CLCV 311a, Egypt of the Pharaohs Joseph Manning

Egypt was among the first centralized territorial states in the world, and, because Egyptian history offers us 4000 years of institutional development and change, the focus of this course is on the long-term development of the ancient Egyptian state, its institutions, and its culture. The course introduces students to the history and culture of ancient Egypt from the rise of the central state to the early Christian period. General historical trends, the relationship of Egyptian history to other contemporary ancient cultures, and the legacy of Egypt to the “West” are also considered. At the end of the course, students have an understanding of the material culture and the historical development of ancient Egypt, and an appreciation for the relationship of the ancient sources to the construction of ancient Egyptian history. HU

HIST 321b / EAST 220b, China from Present to Past, 2015–600 Valerie Hansen

Underlying causes of current issues facing China traced back to their origins in the premodern period. Topics include economic development, corruption, environmental crises, gender, and Pacific island disputes. Selected primary-source readings in English, images, videos, and Web resources. *Optional additional Chinese-language and English-language sections. HU

HIST 325b, Introduction to Latin American History Anne Eller

Critical themes and events in Latin American history from pre-Columbian times to the present. Major formative epochs such as the pre-Columbian era, colonization, independence, and contemporary moments; modern political flashpoints, including Haiti, Cuba, Argentina, and Peru. HU

HIST 332a / AFST 333a, African Encounters with Colonialism Daniel Magaziner

How African societies and peoples encountered, engaged, and endured the colonial and postcolonial world, from the arrival of Kiswahili-speaking traders at the shores of Lake Victoria in the 1840s through the rise and fall of European colonialism and the resulting forms of neocolonialism. Transformations and continuities in African religious life; gendered sociability; popular culture. HU

HIST 335a or b / AFST 335a or b / ER&M 325a or b, A History of South Africa Daniel Magaziner

An introduction to the history of southern Africa, especially South Africa. Indigenous communities; early colonial contact; the legacies of colonial rule; postcolonial mismanagement; the vagaries of the environment; the mineral revolution; segregationist regimes; persistent inequality and crime since the end of apartheid; the specter of AIDS; postcolonial challenges in Zimbabwe, Angola, and Mozambique. HU

HIST 340b / AFST 340b, Africa in the Era of the Slave Trade Robert Harms

Examination of the tumultuous changes experienced by African societies during the era of the Atlantic slave trade, approximately 1450–1850. Focus on the complex interaction between the internal dynamics of African societies and the impact of outside forces.

HU

HIST 345b / JDST 265b / MMES 148b / RLST 202b, Jews in Muslim Lands from the Seventh to the Sixteenth Centuries Staff

Jewish culture and society in Muslim lands from the time of the Prophet Muhammad to that of Suleiman the Magnificent. Topics include Islam and Judaism; Jerusalem as a holy site; rabbinic leadership and literature in Baghdad; Jewish courtiers, poets, and philosophers in Muslim Spain; and the Jews in the Ottoman Empire. HU RP

HIST 351b / MMES 193b / RLST 155b, The Golden Age of Islam Gerhard Bowering

The development of Islamic civilization in the Middle East, North Africa, Spain, Iran, and India from Muhammad through the Mongol invasions to the rise of the Ottoman, Safavid, and Mughal empires (600–1500 C.E.). Emphasis on the intellectual and religious history of Islam in the age of the caliphates and during the rule of regional dynasties. HU

HIST 355a / LAST 355a, Colonial Latin America Stuart Schwartz

A survey of the conquest and colonization of Latin America from pre-Columbian civilizations through the movements for independence. Emphasis on social and economic themes and the formation of identities in the context of multiracial societies.

HU

HIST 375a or b / EAST 375a or b, China from Mao to Now Denise Ho

The history of the People's Republic of China from Mao to now, with a focus on understanding the recent Chinese past and framing contemporary events in China in historical context. How the party-state is organized; interactions between state and society; causes and consequences of economic disparities; ways in which various groups – from intellectuals to religious believers – have shaped the meaning of contemporary Chinese society. HU

HIST 416b / EVST 211b / G&G 211b / HSHM 211b, Global Catastrophe since 1750

William Rankin

A history of the geological, atmospheric, and environmental sciences, with a focus on predictions of global catastrophe. Topics range from headline catastrophes such as global warming, ozone depletion, and nuclear winter to historical debates about the age of the Earth, the nature of fossils, and the management of natural resources. Tensions between science and religion; the role of science in government; environmental economics; the politics of prediction, modeling, and incomplete evidence. HU

HIST 465a / EVST 209a / HSHM 209a, Making Climate Knowledge Deborah Coen

This is a course about *how* humans have come to know what we know about our impacts on the earth's climate and our vulnerability to climate change. When did humans first *know* that their actions, in the aggregate, could transform the planet? Did scientists bear responsibility to warn of these consequences? In what ways has the modern science of climate both appropriated and undermined traditional and indigenous forms of climate knowledge? Students learn to work with the methods of history of science: we analyze science as a social and material process bound to the cultural and epistemological particularities of its historical context, and we examine the

political dimensions of historical narratives about the emergence of the theory of global warming. Via hands-on experience with Yale's historical collections, students learn to analyze maps, artifacts, and instruments as historical sources. They also gain familiarity with the methods of environmental history, learning to attend to historical evidence of shifting relationships between humans and non-humans. Finally, students become more attuned to the evidence of climate change around them and more confident in their ability to make climate knowledge for themselves. WR, HU

HIST 479a / AFAM 170a / HSHM 241a, Sickness and Health in African American History Carolyn Roberts

A history of American medicine through the African American experience covering the period of slavery through #BlackLivesMatter. Oriented around the complex dynamics of medical abuse and medical resistance, key themes include medicine and slavery; gender and reproduction; medical experimentation and ethics; the rise of racial science; lynching and vigilante violence; segregation and public health; African-descended approaches to health and healing; the rise of the African American medical profession; and black health activism from slavery to #BlackLivesMatter. HU

Departmental Seminars

All History majors must take at least two departmental seminars. Seminars on the history of the United States or Canada are numbered 100J to 199J; seminars on Britain and Europe are 200J to 299J; and seminars on Africa, Asia, Latin America, and the Middle East are 300J to 399J. Seminars numbered in the 400s address global topics; students must apply to the director of undergraduate studies in History to count a 400-level seminar toward a particular geographical distribution category. Each departmental seminar aims to acquaint students in a substantial and professional way with the literature of a period in history; to train them as far as possible in the use of primary source materials; to introduce them to problems of bibliography, historiography, and historical method; and to give them training in the writing of history. The relative importance of these objectives in any particular seminar depends on its subject matter, the previous preparation of its students, and the availability of materials.

Each term declared History majors should apply for departmental seminars for the following term using the online seminar preregistration site. Preregistration begins after midterm in the fall for seminars offered in the spring term, and after spring recess for seminars offered in the subsequent fall term. All students who wish to preregister must declare their major beforehand.

During the course selection period, application for admission should be made directly to the instructors of the seminars, who will admit students to remaining vacancies in their seminars. Priority is given to applications from juniors, then seniors, majoring in History, but applications are also accepted from qualified sophomores and from students majoring in other disciplines or programs. The department seeks wherever possible to accommodate students' preferences; for their part, students should recognize that limitations imposed by the size of seminars (normally fifteen students) make accommodation impossible in some instances. HIST 494 and residential college seminars that count toward the History major do not fulfill the departmental seminar requirement.

* **HIST 105Jb / ENGL 272b / HUMS 352b, American Imagination: From the Gilded Age to the Cold War** David Bromwich and Bryan Garsten

Survey of major ideas, writings, and cultural movements that have shaped American life and thought from 1880 to 1990. Assignments encompass works of fiction, philosophy, social and political thought, and film. HU RP

* **HIST 106Ja, A History of the United States and Latin America** Gregory Grandin

This seminar focuses on the history of the United States and Spanish, French, and Portuguese America, from the Age of Revolution to the present day. It covers such topics as the American, Haitian, and Spanish-American Revolutions; the Monroe Doctrine; the Confederacy's foreign policy toward Spanish America, Brazil, and Haiti; William Walker's invasion and occupation of Nicaragua; the end of slavery throughout the Americas, and the New World consolidation of *jus soli* (or birthright) notions of citizenship; the War of 1898; the building of the Panama Canal; US counterinsurgencies in Haiti, Nicaragua, and the Dominican Republic; the Good Neighbor Policy; the politics and culture of the Cold War, including CIA interventions in Guatemala, Chile, and Nicaragua; and the Invasion of Panama. Combining social, intellectual, and diplomatic history, the course covers topics such as the region's revolutionary wars for independence; comparative republicanism; the creation of borders; the expansion and abolition of slavery; more revolutions, and counterrevolutions; military interventions and coups; and evolving forms of political economy. The course's main comparative framework is to examine how the United States and Latin America both advanced, and struggled to define, a set of New World ideas and political forms: Christianity, republicanism, liberalism, democracy, sovereignty, rights, and, above all, the very idea of America. WR, HU

* **HIST 113Jb, Women, Gender, and Work in United States History** Staff

This course examines the histories of women, gender, and work in modern American history. We investigate the following questions: How is work a gendering experience? How have historians of women and gender expanded and redefined the category of work? What is the relationship between gender and notions of value and skill? We examine forms of waged and unwaged labor, including domestic, intimate, consumer, and sexual labors. We consider how questions of work, labor, and gender intersect with the categories of race, sexuality, nationality, empire, disability, religion, and age. We also consider how diverse groups of women understood their experiences of work, negotiated competing responsibilities and expectations, and struggled to transform working conditions and address social problems. WR, HU

* **HIST 128Jb / HSHM 475b, Race and Disease in American Medicine** Sakena Abedin

An exploration of the history of race and disease in American medicine from the late 19th century to the present, focusing on clinical practice and clinical research. We discuss cancer, psychiatric disease, sickle cell disease, and infectious diseases including tuberculosis and HIV. We examine the role of race in the construction of disease and the role of disease in generating and supporting racial hierarchies, with special attention to the role of visibility and the visual in these processes. We also consider the history of race and clinical research, and the implications of racialized disease construction for the production of medical knowledge. WR, HU

* **HIST 130Ja / AMST 441a / ER&M 370a, Indians and the Spanish Borderlands** Ned Blackhawk

The experiences of Native Americans during centuries of relations with North America's first imperial power, Spain. The history and long-term legacies of Spanish colonialism from Florida to California. WR, HU

* **HIST 134Jb, Yale and America: Selected Topics in Social and Cultural History** Jay Gitlin

Relations between Yale and Yale people—from Ezra Stiles and Noah Webster to Cole Porter, Henry Roe Cloud, and Maya Lin—and American society and culture. Elihu Yale and the global eighteenth century; Benjamin Silliman and the emergence of American science; Walter Camp, Dink Stover, and the all-American boy; Henry Luce and the information age; faith and ideology in postwar Yale and America. WR, HU

* **HIST 135Ja, The Age of Hamilton and Jefferson** Joanne Freeman

The culture and politics of the revolutionary and early national periods of American history, using the lives, ideas, and writings of Thomas Jefferson and Alexander Hamilton as a starting point. Topics include partisan conflict, political culture, nation building, the American character, and domestic life. WR, HU

* **HIST 137Ja / AFAM 227a / AMST 227a / ER&M 349a, From the Voting Rights Act to #blacklivesmatter** Staff

This course explores the period beginning from 1964 through the emergence of the #blacklivesmatter movement in 2013. Key concepts covered in this course include the Black Panther Party and rise of the Black Power movement; political campaigns of Shirley Chisholm, Jesse Jackson, and Barack Obama. The seminar concludes with an examination of the #blacklivesmatter movement and broader efforts addressing mass incarceration, poverty, and opportunity gaps in education. HU

* **HIST 144Ja / GLBL 250a, Lessons of the Past** Michael Brenes

This course explores how American policymakers have used or misused history in making foreign policy decisions since World War I. In addition to the course readings on this topic, students examine the archives of American diplomats and policymakers behind those decisions. Students are introduced to the vast archival holdings of the Yale Library in diplomatic and international history, and are expected to use archival collections in their assignments. We discuss historical methods and the process of archival research alongside the history of 20th century American foreign policy. HU

* **HIST 150Ja / HSHM 406a, Healthcare for the Urban Poor** Sakena Abedin

Exploration of the institutions, movements, and policies that have attempted to provide healthcare for the urban poor in America from the late nineteenth century to the present, with emphasis on the ideas (about health, cities, neighborhoods, poverty, race, gender, difference, etc) that shaped them. Topics include hospitals, health centers, public health programs, the medical civil rights movement, the women's health movement, and national healthcare policies such as Medicare and Medicaid.

* **HIST 151Jb / AMST 422b / ER&M 435b, Writing Tribal Histories** Ned Blackhawk

HISTORICAL overview of American Indian tribal communities, particularly since the creation of the United States. Challenges of working with oral histories, government documents, and missionary records. WR, HU

* **HIST 164Ja, Foxes, Hedgehogs, and History** John Gaddis

Application of Isaiah Berlin's distinction between foxes and hedgehogs to selected historical case studies extending from the classical age through the recent past. WR, HU

* **HIST 166Ja / AMST 410a / WGSS 409a, Asian American Women and Gender, 1830 to the Present** Mary Lui

Asian American women as key historical actors. Gender analysis is used to reexamine themes in Asian American history: immigration, labor, community, cultural representations, political organizing, sexuality, and marriage and family life. WR, HU

* **HIST 167Ja / PLSC 209a / PLSC 839, Congress in the Light of History** David Mayhew

This course begins by studying analytic themes, including congressional structure, incentives bearing on members and parties, conditions of party control, supermajority rules, and polarization, followed by narrative works of major political showdowns entailing Congress such as those in 1850, 1876-77, 1919 (defeat of the Versailles Treaty), 1937 (defeat of court-packing), 1954 (the McCarthy-Army hearings), 1964 (civil rights), 1973-74 (Watergate), and 1993-94 (defeat of health care). Students also examine a series of policy performances, for the better or the worse in today's judgments, ranging from early state-building through reacting to the Great Depression, constructing a welfare state, and addressing climate change. This is a reading course and does not accommodate senior essays. SO

* **HIST 168Jb, Quebec and Canada from 1791 to the Present** Jay Gitlin

The history of Quebec and its place within Canada from the Constitutional Act of 1791 to the present. Topics include the Rebellion of 1837, confederation, the Riel Affair, industrialization and emigration to New England, French-Canadian nationalism and culture from Abbé Groulx to the Parti Québécois and Céline Dion, and the politics of language. Readings include plays by Michel Tremblay and Antonine Maillet in translation. WR, HU

* **HIST 174Ja / AMST 451a / RLST 260a, Religion, War, and the Meaning of America** Harry Stout

The relationship between religion and war in American history from colonial beginnings through Vietnam. The religious meanings of Americans at war; the mutually reinforcing influences of nationalism and religion; war as the norm of American national life; the concept of civil religion; biblical and messianic contexts of key U.S. conflicts. HU

* **HIST 176Ja / HSHM 465a / WGSS 457a, Reproductive Health, Gender & Power in the U.S.** Ziv Eisenberg

This seminar examines women's and men's reproductive health in the United States from the 19th century to the present. How have gender norms and social power structures shaped medical knowledge, scientific investigation, political regulation, and private reproductive experiences? What do the lessons of the history of reproductive health tell us about contemporary policy, legal and economic debates? Topics include abortion, activism, childbirth, contraceptives, eugenics, feminism, fertility, medicalization, pregnancy, reproductive science and technology, sexual health, social justice, and sterilization. WR, HU

* **HIST 179Ja / HSHM 415a, Historical Perspectives on Science and Religion** Ivano Dal Prete

The engagement between science and religion from a historical standpoint and a multicultural perspective. The Islamic, Jewish, Buddhist, and Christian traditions; the roots of modern creationism; salvation expectations and the rise of modern science and technology. General knowledge of western and world history is expected. WR, HU

* **HIST 191Ja / WGSS 354a, Women, Gender, and Grassroots Politics in the United States after World War II** Jennifer Klein

American politics and grassroots social movements from 1945 to the present explored through women's activism and through gender politics more broadly. Ideas about gender identities, gender roles, and family in the shaping of social movements; strategies used on the local, regional, national, and international levels. Connections between organizing and policy, public and private, state and family, and migration, immigration, and empire. WR, HU

* **HIST 205Jb, Law and Justice in the Middle Ages** Anders Winroth

There was plenty of law in the Middle Ages, but was there any justice? How could justice be served during a period that is famous for the ordeals of fire and water, feud, judgment by God, torture, oath-helpers, and the lack of legal training? The seminar studies how medieval people sought to achieve fairness in their dealings with each other. None. WR, HU

* **HIST 215Jb, The Art of Biography** John Gaddis

A comparative examination of successful as well as unsuccessful biographies, intended to identify both principles and pitfalls. HU

* **HIST 216Ja, Eurasian Encounters before 1500** Paul Freedman

People who traveled between Europe and Asia during the Middle Ages. Focus on the Franciscan missionary William Rubruck, Admiral Zheng He's interpreter Ma Huan, the Arabic diplomat ibn Fadlan, and the merchant and fabulist Marco Polo. HU

* **HIST 229Ja, London, 1560-1760** Keith Wrightson

A study of London's growth between 1560 and 1760 from a modest city of perhaps 50,000 people to a metropolis with over 700,000 inhabitants. Themes include the dynamics of growth; birth and death, with particular reference to the plague; migration; household life; villages within the city; London as the center of print culture; the royal court; polite society in the late seventeenth and early eighteenth centuries; the "middle sort of people" and consumerism; the world of the poor; and vice and criminality. In September and in January, application for admission should be made directly to the instructors of the seminars, who will admit students to remaining vacancies in their seminars. Priority is given to applications from juniors, then seniors, majoring in History, but applications are also accepted from qualified sophomores and from students majoring in other disciplines or programs. Seminars on the history of the United States or Canada are numbered 100J to 199J; seminars on Britain and Europe are 200J to 299J; and seminars numbered 300J to 399J cover the rest of the world. Seminars numbered in the 400s address global topics; students must apply to the director of undergraduate studies in History to count a 400-level seminar toward a particular geographical distribution category. WR, HU

* **HIST 231Jb, The Dark Years: Collaboration and Resistance in Vichy France** John Merriman

The concomitants of collaboration and resistance during Vichy France, 1940–44. Topics include the fall of France in 1940; the return of Pétain's "National Revolution" and its continuities with the French Right during the Third Republic; the extent and nature of resistance (in the context of pre–World War II politics); and the memory of the Vichy years and its influence on subsequent French political life. WR, HU

* **HIST 232Ja / HUMS 443a / JDST 270a / MMES 342a / RLST 201a, Medieval Jews, Christians, and Muslims In Conversation** Ivan Marcus

How members of Jewish, Christian, and Muslim communities thought of and interacted with members of the other two cultures during the Middle Ages. Cultural grids and expectations each imposed on the other; the rhetoric of otherness—humans or devils, purity or impurity, and animal imagery; and models of religious community and power in dealing with the other when confronted with cultural differences. Counts toward either European or Middle Eastern distributional credit within the History major, upon application to the director of undergraduate studies. WR, HU RP

* **HIST 242Jb / CLCV 319b / MGRK 300b / WGSS 293b, The Olympic Games, Ancient and Modern** George Syrimis

Introduction to the history of the Olympic Games from antiquity to the present. The mythology of athletic events in ancient Greece and the ritual, political, and social ramifications of the actual competitions. The revival of the modern Olympic movement in 1896, the political investment of the Greek state at the time, and specific games as they illustrate the convergence of athletic cultures and sociopolitical transformations in the twentieth century. HU

* **HIST 245Jb / GLBL 289b / PLSC 431b, War and Peace in Northern Ireland** Bonnie Weir

Examination of theoretical and empirical literature in response to questions about the insurgency and uneasy peace in Northern Ireland following the peace agreement of 1998 which formally ended the three-decade long civil conflict known widely as The Troubles and was often lauded as the most successful of its kind in modern history. Consideration of how both the conflict and the peace have been messier and arguably more divisive than most outside observers realize. SO

* **HIST 253Ja / LAST 253a, Dissidence and Control in Early Modern Spain and its Empire** María Jordán

Aspects of Spanish culture and society in the Golden Age (c. 1550–1650) that demonstrate discontent, dissidence, and suggestions for reform. Emphasis on the intersection of historical and literary sources and the dynamic between popular and elite cultures. WR, HU

* **HIST 256Ja / HUMS 264a, Imagining the Body Politic: Constitutional Art and Theory from Antiquity to the Present** Staff

Do visual representations of social and political principles have a peculiar power to produce, reproduce, and disturb social and political relations? To what extent might represented principles, with their contradictions and ambiguities, themselves somehow be pictorial, metaphorical, or figurative? This course is an examination of art and metaphorical thinking in the socio-political realm from Plato through Renaissance republicanism to the modern state. HU

* **HIST 260Jb / HSHM 468b, Sex, Life, and Generation** Ivano Dal Prete

Theories and practices of life, sex, and generation in Western civilization. Politics and policies of conception and birth; social control of abortion and infanticide in premodern societies; theories of life and gender; the changing status of the embryo; the lure of artificial life. WR, HU

* **HIST 269Ja, History and Holocaust Testimony** Carolyn Dean

The history and memoirs of Holocaust testimony. How victims' experiences are narrated and assessed by historians. Questions regarding memory and history. WR, HU

* **HIST 277Jb, Memory and History in Modern Europe** Jennifer Allen

An interdisciplinary study of memory as both a tool in and an agent of modern European history. Collective memory; the media of memory; the organization and punctuation of time through commemorative practices. Specific themes vary but may include memory of the French Revolution, the rise of nationalism, World Wars I and II, the Holocaust, decolonization, the revolution of 1968, the fall of the Berlin Wall, and the end of the Cold War. WR, HU

* **HIST 289Jb / HSAR 399b / HSHM 407b / HUMS 220b, Collecting Nature and Art in the Preindustrial World** Paola Bertucci

A history of museums before the emergence of the modern museum. Focus on: cabinets of curiosities and Wunderkammern, anatomical theaters and apothecaries' shops, alchemical workshops and theaters of machines, collections of monsters, rarities, and exotic specimens. WR, HU

* **HIST 292Ja / HIST 286J / HUMS 279a / PLSC 286a, Democracy and the French Revolution** Isaac Nakhimovsky

The French Revolution of 1789 and its legacies, as viewed through the late-eighteenth-century debates about democracy, equality, representative government, and historical change that shaped an enduring agenda for historical and political thought in Europe and around the world. WR, HU

* **HIST 299Ja / HUMS 192a, Intellectuals and Power in Europe** Terence Renaud

The role of intellectuals in politics, with a focus on social, cultural, and political upheavals in Europe during the nineteenth and twentieth centuries. Whether intellectuals betray a higher spiritual calling when they enter politics or merely strive to put their own theories into practice. Modern answers to the question of why ideas and intellectuals matter. HU

* **HIST 303Ja / EAST 303a, Hong Kong and China: A Cross-Border History** Denise Ho

This departmental seminar studies the historical development of Hong Kong and China in relation to each other, from the colonial and late imperial experience to their shared histories in national and political movements, from postwar industrialization to reform-era economic growth, culminating in the 1997 handover and its attendant political and economic integration. The readings from the first half of the semester come primarily from the literature in history, while the readings in the second half draw from anthropology, economics, political science, and sociology. Each week readings include primary sources in or translated into English. HU, SO

* **HIST 305Jb / EAST 402b, Empire and Identity in Qing China** Staff

This seminar covers the history of the Qing empire, which governed China and large parts of Inner Asia from 1644 to 1912, with a thematic focus on a key question: how did

the politics of identity manifest in a society organized under a governmental structure and set of intellectual assumptions very different from those we are familiar with today? The course examines the roles of identity categories like ethnicity, gender, sexuality, religion, and status in the Qing empire and interrogates the role of the Qing imperial system, as a particular political system, in managing different forms of identity. In addition to its core focus on the Qing, the course includes discussions of Chosŏn Korea and the Republic of China, to consider both the role of Qing empire in regional politics and the legacy of empire in China's later history. HU

* **HIST 307Ja / EAST 404a, The Written Word in Japan, Prehistory to 1600** Staff
In premodern Japan, text and writing had the power to imbue swords with ritual meaning, evoke the pathos of cherry blossoms, or reveal means of salvation. People from all walks of life produced and consumed the written word in different ways, whether they hoped to shape military regimes or simply send messages to loved ones, as we might today. In what ways did textuality (or, in some cases, its absence or conscious rejection) shape Japan's social, political, economic, and religious development? What is a "text"? How does understanding its use by diverse peoples across centuries challenge our underlying assumptions about how documents, writing, and communication function in society? Surveying these issues from prehistory to 1600, this course uses writing traditions and documentary culture as a lens through which to understand Japanese history and ways of being in Japan's premodern world. Students use primary and secondary readings to discuss core issues in writing and textual culture, such as language, orality, transmission, translation, gender, genre, communication, and visibility. A complementary emphasis on how we, as modern readers, writers, and scholars, interpret and use written materials further provides students with new strategies for thinking about how history is recorded, consumed, and evaluated. No previous knowledge of Japanese or Japanese history is required. HU

* **HIST 309Ja or b / EAST 309a or b, Uses of the Past in Modern China** Denise Ho
Modern China's use of the past in state-sponsored narratives of nation, in attempts to construct heritage by elites and intellectuals, and in grassroots projects of remembrance. Theories on history and memory; primary sources in English translation; case studies from twentieth-century China. Interdisciplinary readings in art history, anthropology, cultural studies, and history. WR, HU

* **HIST 313Ja / SAST 323a, British Raj and the Indian Nation (1757-1947)** Rohit De
Drawing on a wide genre of primary sources, this seminar explores the consolidation of British rule over the Indian subcontinent; the transformations brought about by colonial policies; the subsequent rise of resistance movements; the growth of mass nationalism and partition and independence. WR, HU

* **HIST 330Jb, Modern Mexico: From Mesoamerica to AMLO** Staff
When most Americans north of the U.S.-Mexico border think about their closest southern neighbors (which is rare enough), they generally think about tacos, tequila, or Corona. They might also think about beach resorts, narcoviolence, or the U.S. president's racist comments about Mexican migrants. Far less often do they think about Mexico's history, politics, or global presence. Most people in the United States – known as *estadonudienses* in Mexico – are woefully ignorant of these elements. This course challenges us to do better amid heightened concerns over human rights both in Mexico and at the border, ongoing debates about the so-called new NAFTA deal, and the intensification of related conflicts affecting Mexico's 124 million citizens (about

12 million of whom reside in the U.S.). We cover over 500 years of Mexican history: from the conquest and colonization of Mesoamerica (for our purposes, “Mexico” before 1492); through the labyrinthine pathways to independence and national sovereignty during the formative yet formidable nineteenth century; to the revolutionary processes of the early twentieth century and their enduring impact on nation-state formation, popular culture, and international relations up until the historic presidential election of 2000 and the equally historic election of President Andrés Manuel López Obrador (AMLO) in July 2018. WR, HU

* **HIST 344Ja or b, The Middle East Before Oil** Staff

For many of us, oil defines Middle Eastern modernity. In fact it defines the Middle East—its economies, its politics, its societies. Focusing on the parts of the Middle East now associated with oil, this course looks first at states and next at economies to ask what, who, and where was modern in the Middle East before oil? How has the Middle East participated in crafting the global modern? Considering issues of capital, empire, and technology, before ending with a discussion of some of the less-studied cultural aspects of oil modernity, the course ultimately asks us to consider what is special—and not—about the Middle East, and about oil. Cultural and political material produced by individuals and states in the region—from maps to music and diaries to film—provide a variety of perspectives on the last years of empire in the region. The diverse economic, political, and technical responses Middle Eastern actors offered to European imperialism and global capital, and the ways those responses in turn shaped imperialism and capitalism, outline an unexpected Middle Eastern modernity. WR, HU

* **HIST 383Ja / AFAM 213a / HSHM 481a, Medicine and Race in the Slave Trade**

Carolyn Roberts

Examination of the interconnected histories of medicine and race in the slave trade. Topics include the medical geography of the slave trade from slave prisons in West Africa to slave ships; slave trade drugs and forced drug consumption; mental and physical illnesses and their treatments; gender and the body; British and West African medicine and medical knowledge in the slave trade; eighteenth-century theories of racial difference and disease; medical violence and medical ethics. HU

* **HIST 347Ja / MMES 442a, From the Great Game to the Great Satan: Iran, Afghanistan, and Central Asia in the Age of Empires** Abbas Amanat

Encounters of Iran and its neighbors with Britain, Russia, and the United States since the nineteenth century. Special attention to Western imperial interests in the region and to indigenous forms of resistance to imperial hegemony. Topics include travel, diplomacy, war and hegemony, postcolonial sovereignty, the Cold War and regional power, and the Islamic Republic's demonizing of America. WR, HU

* **HIST 372Ja / ER&M 342a / LAST 372a, Revolutionary Change and Cold War in Latin America** Gilbert Joseph

Analysis of revolutionary movements in Latin America against the backdrop of the Cold War. Critical examination of popular images and orthodox interpretations. An interdisciplinary study of the process of revolutionary change and cold war at the grassroots level. WR, HU

* **HIST 382Ja, Vietnamese History from Earliest Times to 1920** Benedict Kiernan
Evolution of a Vietnamese national identity, from Chinese colonization to medieval statehood, to French conquest and capitalist development. The roles of Confucianism, Buddhism, gender, and ethnicity in the Southeast Asian context. WR, HU

* **HIST 403Jb / HSHM 473b, Vaccination in Historical Perspective** Jason Schwartz
For over two centuries, vaccination has been a prominent, effective, and at times controversial component of public health activities in the United States and around the world. Despite the novelty of many aspects of contemporary vaccines and vaccination programs, they reflect a rich and often contested history that combines questions of science, medicine, public health, global health, economics, law, and ethics, among other topics. This course examines the history of vaccines and vaccination programs, with a particular focus on the 20th and 21st centuries and on the historical roots of contemporary issues in U.S. and global vaccination policy. Students gain a thorough, historically grounded understanding of the scope and design of vaccination efforts, past and present, and the interconnected social, cultural, and political issues that vaccination has raised throughout its history and continues to raise today. HU

* **HIST 405Jb / ENGL 264b, The Real Thing: Forgery and the Authentic, 1500-1800**
Kathryn James

This course leads from the premise that our primary relationship with the textual object, and perhaps most particularly to the forged textual object, is epistemological: we want to believe – but in what? We begin with a condensed “boot camp” for approaching objects, introducing some of the specialized and technical knowledge that can help us make sense of what is in front of us. We consider what methods and questions can yield the most complex and intriguing answers, and grapple with our own impulses to make meaning, particularly when it comes to objects that do not quite conform to our expectations (or perhaps conform to our expectations a little too closely, as forged materials often do). WR, HU

* **HIST 419Jb / HSHM 433b / WGSS 419b, Gender and Science** Deborah Coen
Exploration of the dual potential of the sciences to reinforce received ideas about gender or to challenge existing sexual and racial hierarchies; the rise of the ideas and institutions of the modern sciences as they have reflected and shaped new notions of femininity and masculinity.

* **HIST 426Ja / GLBL 398a, Yale and the World: Global Power, Local History** David Engerman

This course uses moments in the history of Yale University to shed light on the forms, functions, and trajectory of U.S. global power from the late 19th century through the early 21st century. Key episodes include missionary work in East Asia, scientific expeditions in South America, mobilization for war and Cold War, and the internationalization of the student body. Students investigate these episodes by reading scholarly work as well as archival sources, and through discussions with Yale faculty and staff. HU

* **HIST 445Ja / HSHM 454a, Natural History in History** Paola Bertucci
The changing meaning and practice of natural history, from antiquity to the present. Topics include: technologies and epistemologies of representation, the commodification of natural specimens and bioprospecting, politics of collecting and

display, colonial science and indigenous knowledge, and the emergence of ethnography and anthropology. Students work on primary sources in Yale collections. HU

* **HIST 455Jb / HUMS 287b / WGSS 347b, The Theory and Practice of Resistance**

Terence Renaud

Exploration of the histories and theories of resistance in the modern world. How liberation movements, guerrillas, and oppressed groups appeal to resistance as an organizational strategy and as moral justification. Readings include Kant, Thoreau, Nietzsche, Luxemburg, Lenin, Gandhi, Fanon, Arendt, Marcuse, Foucault, A. Lorde, Said, and J. Butler. Themes include antifascism to terrorism; violence to nonviolence, the New Left to Black Lives Matter. HU

* **HIST 467Ja / HSHM 422a, Cartography, Territory, and Identity** William Rankin

Exploration of how maps shape assumptions about territory, land, sovereignty, and identity. The relationship between scientific cartography and conquest, the geography of statecraft, religious cartographies, encounters between Western and non-Western cultures, and reactions to cartographic objectivity. Students make their own maps. No previous experience in cartography or graphic design required. WR, HU

* **HIST 482Jb / GLBL 342b / PLSC 321b, Studies in Grand Strategy I** Beverly Gage

The study of grand strategy, of how individuals and groups can accomplish large ends with limited means. The spring term focuses on key moments in history that illustrate strategic thinking in action. During the summer, students undertake research projects or internships analyzing strategic problems or aspects of strategy. The following fall, students put their ideas into action by applying concepts of grand strategy to present day issues. Admission is by application only; the cycle for the current year is closed. This course does not fulfill the history seminar requirement, but may count toward geographical distributional credit within the History major for any region studied, upon application to the director of undergraduate studies. Previous study courses in political science, history, global affairs, or subjects with broad interdisciplinary relevance encouraged. HU, SO

* **HIST 483Ja / GLBL 344a / PLSC 161a, Studies in Grand Strategy II** Beverly Gage

The study of grand strategy, of how individuals and groups can accomplish large ends with limited means. During the fall term, students put into action the ideas studied in the spring term by applying concepts of grand strategy to present day issues. Admission is by application only; the cycle for the current year is closed. This course does not fulfill the history seminar requirement, but may count toward geographical distributional credit within the History major for any region studied, upon application to the director of undergraduate studies. Prerequisite: PLSC 321. Previous study courses in political science, history, global affairs, or subjects with broad interdisciplinary relevance encouraged. SO

* **HIST 491Jb / EVST 368b / HSHM 479b / RLST 368b, The History of the Earth from Noah to Darwin** Ivano Dal Prete

Young earth creationism and flood geology have long been among the most divisive features of American culture and politics. Yet a basic postulate is shared across the spectrum: for better or worse, the old age of the Earth is regarded as the recent product of a secular science, consistently rejected by traditional Christianity. This seminar challenges this long-established narrative, by uncovering the surprising boldness, complexity, and societal diffusion of pre-modern debates on the history of the

Earth, and of humankind itself. Students have opportunity to explore the nature, assumptions, and methods of Earth sciences before the advent of modern geology, to question ingrained assumptions about their relation to religion and society, and to place outstanding issues into historical perspective. How have the great monotheistic religions dealt with the possibility of an ancient Earth? Was a young creation always important in traditional Christianity? If not, what led to the emergence of young Earth creationism as a force to be reckoned with? What are the intellectual roots of American preadamism, which claims that the black and white races were created at different times and do not descend from the same ancestor? These and other questions are addressed not only through scholarly literature in the field, but also with the analysis of literary, visual, and material sources available on campus. WR, HU

Writing Tutorial and Senior Essay Courses

* HIST 494a or b, Individual Writing Tutorial Staff

For students who wish, under the supervision of a member of the faculty, to investigate an area of history not covered by regular departmental offerings. The course may be used for research or for directed reading. It is normally taken only once. The emphasis of the tutorial is on writing a long essay or several short ones. To apply for admission, a student should present the following materials to the director of undergraduate studies on the Friday before schedules are due: a prospectus of the work proposed, a bibliography, and a letter of support from a member of the History department faculty who will direct the tutorial. A form to simplify this process is available from the office of the director of undergraduate studies.

* HIST 495a or b and HIST 496a or b, The Senior Essay Staff

All senior History majors should attend the mandatory senior essay meeting in early September at a time and location to be announced in the online Senior Essay Handbook. The senior essay is a required one- or two-term independent research project conducted under the guidance of a faculty adviser. As a significant work of primary-source research, it serves as the capstone project of the History major. Students writing the one-term senior essay enroll in HIST 497 (see description), not HIST 495 and 496. The two-term essay takes the form of a substantial article, not longer than 12,500 words (approximately forty to fifty double-spaced typewritten pages). This is a maximum limit; there is no minimum requirement. Length will vary according to the topic and the historical techniques employed. Students writing the two-term senior essay who expect to graduate in May enroll in HIST 495 during the fall term and complete their essays in HIST 496 in the spring term. December graduates enroll in HIST 495 in the spring term and complete their essays in HIST 496 during the following fall term; students planning to begin their essay in the spring term should notify the senior essay director by early December. Each student majoring in History must present a completed Statement of Intention, signed by a department member who has agreed to serve as adviser, to the History Department Undergraduate Registrar by the dates indicated in the Senior Essay Handbook. Blank statement forms are available from the History Undergraduate Registrar and in the Senior Essay handbook. Students enrolled in HIST 495 submit to the administrator in 237 HGS a two-to-three-page analysis of a single primary source, a draft bibliographic essay, and at least ten pages of the essay by the deadlines listed in the Senior Essay Handbook. Those who meet these requirements receive a temporary grade of SAT for the fall term, which will be changed to the grade received by the essay upon its completion. Failure to meet any requirement

may result in the student's being asked to withdraw from HIST 495. Students enrolled in HIST 496 must submit a completed essay to 211 HGS no later than 5 p.m. on the dates indicated in the Senior Essay Handbook. Essays submitted after 5 p.m. will be considered as having been turned in on the following day. If the essay is submitted late without an excuse from the student's residential college dean, the penalty is one letter grade for the first day and one-half letter grade for each of the next two days past the deadline. No essay that would otherwise pass will be failed because it is late, but late essays will not be considered for departmental or Yale College prizes. All senior departmental essays will be judged by members of the faculty other than the adviser. In order to graduate from Yale College, a student majoring in History must achieve a passing grade on the departmental essay.

*** HIST 496a or b, The Senior Essay Staff**

All senior History majors should attend the mandatory senior essay meeting in early September at a time and location to be announced in the online Senior Essay Handbook. The senior essay is a required one- or two-term independent research project conducted under the guidance of a faculty adviser. As a significant work of primary-source research, it serves as the capstone project of the History major. Students writing the one-term senior essay enroll in HIST 497 (see description), not HIST 495 and 496. The two-term essay takes the form of a substantial article, not longer than 12,500 words (approximately forty to fifty double-spaced typewritten pages). This is a maximum limit; there is no minimum requirement. Length will vary according to the topic and the historical techniques employed. Students writing the two-term senior essay who expect to graduate in May enroll in HIST 495 during the fall term and complete their essays in HIST 496 in the spring term. December graduates enroll in HIST 495 in the spring term and complete their essays in HIST 496 during the following fall term; students planning to begin their essay in the spring term should notify the senior essay director by early December. Each student majoring in History must present a completed Statement of Intention, signed by a department member who has agreed to serve as adviser, to the History Department Undergraduate Registrar by the dates indicated in the Senior Essay Handbook. Blank statement forms are available from the History Undergraduate Registrar and in the Senior Essay handbook. Students enrolled in HIST 495 submit to the administrator in 237 HGS a two-to-three-page analysis of a single primary source, a draft bibliographic essay, and at least ten pages of the essay by the deadlines listed in the Senior Essay Handbook. Those who meet these requirements receive a temporary grade of SAT for the fall term, which will be changed to the grade received by the essay upon its completion. Failure to meet any requirement may result in the student's being asked to withdraw from HIST 495. Students enrolled in HIST 496 must submit a completed essay to 211 HGS no later than 5 p.m. on the dates indicated in the Senior Essay Handbook. Essays submitted after 5 p.m. will be considered as having been turned in on the following day. If the essay is submitted late without an excuse from the student's residential college dean, the penalty is one letter grade for the first day and one-half letter grade for each of the next two days past the deadline. No essay that would otherwise pass will be failed because it is late, but late essays will not be considered for departmental or Yale College prizes. All senior departmental essays will be judged by members of the faculty other than the adviser. In order to graduate from Yale College, a student majoring in History must achieve a passing grade on the departmental essay.

*** HIST 497a or b, One-Term Senior Essay Staff**

All senior History majors should attend the mandatory senior essay meeting in early September at a time and location to be announced in the online Senior Essay Handbook. The senior essay is a required one- or two-term independent research project conducted under the guidance of a faculty adviser. As a significant work of primary-source research, it serves as the capstone project of the History major. Seniors writing a two-term senior essay do not register for HIST 497; instead, they register for HIST 495 and HIST 496 (see description). History majors may choose to write a one-term independent senior essay in the first term of their senior year and register for HIST 497; however, students who choose the one-term senior essay option are not eligible for Distinction in the Major. The one-term essay must include a substantial research paper of no more than 6,250 words (approximately twenty-five pages) based on primary sources, along with a bibliographic essay and bibliography. Seniors enroll during the fall term of senior year; only History majors graduating in December may enroll during the spring term (or seventh term of enrollment). In rare circumstances, with the permission of the adviser and the Senior Essay Director, a student enrolled in HIST 497 during the fall term may withdraw from the course according to Yale College regulations on course withdrawal and enroll in the spring term. Each student enrolled in HIST 497 must present a completed Statement of Intention, signed by a department member who has agreed to serve as adviser, to the History Department Undergraduate Registrar by the dates indicated in the Senior Essay Handbook. Blank statement forms are available from the History Undergraduate Registrar and in the Senior Essay Handbook, available on the History department Web site. Additional details about the senior essay, including the submission deadlines are included in the Senior Essay Handbook. Essays submitted after 5 p.m. on the due date will be considered as having been turned in on the following day. If the essay is submitted late without an excuse from the student's residential college dean, the penalty is one letter grade for the first day and one-half letter grade for each of the next two days past the deadline. No essay that would otherwise pass will be failed because it is late. All senior departmental essays will be judged by members of the faculty other than the adviser. In order to graduate from Yale College, a student majoring in History must achieve a passing grade on the departmental essay. Permission of the departmental Senior Essay Director and of the student's faculty adviser is required for enrollment.

History of Art

Director of undergraduate studies: Marisa Bass (marisa.bass@yale.edu), Loria 752, 432-2666; arthistory.yale.edu

Art history is the study of all forms of art, architecture, and visual culture in their social and historical contexts. The History of Art major can serve either as a general program in the humanities or as the groundwork for more specialized training. Unless otherwise indicated, all courses in History of Art are open to all students in Yale College.

COURSE NUMBERING

100-level courses are broad introductory surveys that address basic art history from a number of regional and thematic perspectives. Prospective majors are encouraged to take the surveys as early in their course of study as possible. Under certain circumstances, students who have taken the Advanced Placement test in art history may earn acceleration credit and, in consultation with the director of undergraduate studies (DUS), may place out of one required 100-level course.

Intermediate and advanced courses, numbered above 200, encompass more specialized surveys and themes in art history.

REQUIREMENTS OF THE MAJOR

Twelve course credits are required to complete the major: two introductory courses at the 100 level; four intermediate and advanced courses at the 200 and 300 levels; two seminars at the 400 level; a methods seminar, HSAR 401; two electives; and the senior essay, HSAR 499.

The major requires that the six courses numbered above 200, of which two must be seminars numbered above 400, must satisfy both a geographical and a chronological distributional requirement. The geographical requirement is divided into five areas: Africa and the Pacific; the Americas; Asia and the Near East; Europe; and transregional. The chronological requirement is similarly divided into five segments: earliest times to 800; 800–1500; 1500–1800; 1800 to the present; and transchronological. These six intermediate and advanced courses must be chosen from four different geographical areas and four different time periods; a single course can fulfill both a geographical and a chronological requirement.

Only classes originating in the History of Art department can fulfill the distributional requirements.

Junior seminar The methods seminar HSAR 401, *Critical Approaches to Art History*, is a wide-ranging introduction to the practices of the art historian and the history of the discipline. It is to be taken during the fall or spring term of the junior year.

Credit/D/Fail courses Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

Roadmap See the visual roadmap of the requirements.

SENIOR REQUIREMENT

The senior essay is a research paper written usually in one term in HSAR 499. Students choose their own topics, which may derive from research done in an earlier course. The

essay is planned during the previous term in consultation with a qualified instructor and/or with the DUS. It is also possible to write a two-term senior essay; students wishing to do so must submit a petition to the DUS and the prospective adviser, normally by the first week after spring break of the junior year.

ADVISING

Electives may include courses from other departments if they have direct relevance to the major program of study. Approval of the DUS is required.

History of Art majors are urged to study foreign languages. Students considering graduate work should discuss with their advisers the appropriate language training for their field of interest.

Graduate courses Courses in the Graduate School are open to undergraduates with permission of the instructor and of the director of graduate studies. Course descriptions are available in the History of Art office in the Jeffrey Loria Center, 190 York St.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 12 course credits

Distribution of courses 2 courses at 100 level; 6 courses numbered above 200, 2 of which must be 400-level seminars, fulfilling distributional requirements in 4 geographical and 4 chronological categories; 2 electives

Specific course required HSAR 401

Substitution permitted With DUS permission, 2 electives from related depts

Senior requirement Senior essay (HSAR 499)

FACULTY OF THE DEPARTMENT OF HISTORY OF ART

Professors Carol Armstrong, Tim Barringer (*Chair*), Edward Cooke, Jr., Diana Kleiner, Kobena Mercer, Barbara Mundy (*Visiting*), Robert Nelson, Kishwar Rizvi, Nicola Suthor, Mimi Yiengpruksawan

Associate Professors Marisa Bass, Cecile Fromont, Milette Gaifman, Jacqueline Jung, Jennifer Raab

Assistant Professors Rizvana Bradley, Craig Buckley, Aglaya Glebova, Subhashini Kaligotla, Quincy Ngan

Lecturers Molly Brunson (*Affiliated Faculty*), Carolyn Laferriere, Kaitlin McCormick, Margaret Olin

Courses

* **HSAR 002a / AMST 007a, Furniture and American Life** Edward Cooke
In-depth study and interpretation of American furniture from the past four centuries. Hands-on experience with furniture in the collection of the Yale University Art Gallery to explore such topics as materials, techniques, styles, use, and meaning. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.
WR, HU RP

* **HSAR 015a / SAST 060a, Ten Indian Objects** Subhashini Kaligotla
A 5000-year-old stone seal, a 20th century comic book, an emperor's painted portrait, a processional bronze god, a miniature temple, an inscribed pillar, a rock crystal reliquary,

a serene Buddha, an animated film, and a towering female figure. Through rigorous explorations of these ten objects from South Asia this seminar teaches close looking, vivid writing, and narrating history through things. It considers both the biographies of the objects and their involvement in the wider social, political, artistic, and cultural histories of the Indian subcontinent. Students engage some of the most exciting scholarship in the field of South Asian art, and observe, draw, and write about things in museums and art collections on a weekly basis. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

*** HSAR 016a / EAST 016a, Chinese Painting and Culture** Quincy Ngan

This course focuses on important works of Chinese painting and major painters from the fourth century CE to the twentieth century. Through close readings of the pictorial contents and production contexts of such works of art, this course investigates the works' formats, meanings, and innovations from social, historical, and art-historical perspectives. In this course, students become familiar with the traditional Chinese world and acquire the knowledge necessary to be an informed viewer of Chinese painting. Discussions of religion, folkloric beliefs, literature, relationships between men and women, the worship of mountains, the laments of scholars, and the tastes of emperors and wealthy merchants also allow students to understand the cultural roots of contemporary China. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program.

HSAR 110b / ARCG 110b, Introduction to the History of Art: Global Decorative Arts

Edward Cooke

Global history of the decorative arts from antiquity to the present. The materials and techniques of ceramics, textiles, metals, furniture, and glass. Consideration of forms, imagery, decoration, and workmanship. Themes linking geography and time, such as trade and exchange, simulation, identity, and symbolic value. HU

HSAR 115b, Introduction to the History of Art: Renaissance to the Present Tim

Barringer

Painting, sculpture, and graphic arts, with some reference to architecture. Selected major works and artists treated in terms of form, function, and historical context. Introduction to visual analysis. Special attention to contact between Europe and its others. HU

HSAR 143a / RLST 188a / SAST 260a, Introduction to the History of Art: Buddhist

Art and Architecture, 900 to 1600 Mimi Yiengpruksawan

Buddhist art and architecture of East Asia, Southeast Asia, and Tibet from the tenth century to the early modern period. Emphasis on cross-regional engagements including the impact of Islam. HU

HSAR 150a, Sacred Art and Architecture: A Global Perspective Jacqueline Jung

A wide-ranging, cross-temporal exploration of religious images, objects, and architecture in diverse cultures, from ancient Mesopotamia to modern Manhattan. Buddhist, Christian, Hindu, Jewish, Muslim, and various polytheistic traditions are represented. Thematic threads include the human body; transformations of nature; death, memory, and afterlife; sacred kingship and other forms of political engagement; practices of concealment and revelation; images as embodiments of the divine; the framing and staging of ritual through architecture. HU

HSAR 176a / HUMS 176a, The Politics of Representation Marisa Bass

This global introductory course surveys how works of art and architecture have responded to political ideals, shaped political life, and galvanized political debate from antiquity to the present. We consider the relation between visual representation and political representation, addressing how artists and architects have responded to the demands of democracy, empire, war, and revolution, and how individuals and communities have reacted with and against the works that they produced. Topics span from propaganda to public monuments, icons to iconoclasm, civic buildings to border walls, and from the politics of display to political censorship. Ranging from painting, sculpture, prints, and photography to architecture, landscape design, and military fortification, this course aims to de-center ‘western’ notions of artistic achievement in its multi-media and transnational scope. Lectures and assignments emphasize close looking and close reading, skills which are essential to making us better viewers and citizens. Open to all, including those with no prior background in art history. Sections will include visits to collections and sites across Yale campus. HU

HSAR 208b / AFAM 184b / AFST 208b, African Arts and Expressive Cultures Cecile Fromont

This course is an introduction to the arts and expressive cultures of a selection of regions from the African continent, and the Americas. Lectures, readings, and discussions explore the relationship between art and leadership, religion, society, and history on the continent and within African diasporic communities in the Americas. Class meetings and assignments make use of the distinguished collection of African objects at the Yale University Art Gallery. HU

HSAR 219b / AMST 197b / ARCH 280b, American Architecture and Urbanism Elihu Rubin

Introduction to the study of buildings, architects, architectural styles, and urban landscapes, viewed in their economic, political, social, and cultural contexts, from precolonial times to the present. Topics include: public and private investment in the built environment; the history of housing in America; the organization of architectural practice; race, gender, ethnicity and the right to the city; the social and political nature of city building; and the transnational nature of American architecture. HU

HSAR 220b, Introduction to Contemporary Art Pamela Lee

Introduction of the pivotal figures, tendencies, and criticism of the art of the last three decades, exploring questions of material, form, media, process, and aesthetics relative to social, political, and economic issues. Popular media depict contemporary art as luxury goods for celebrities, oligarchs, and elites. This class provides a historical and theoretically nuanced picture of recent art and its critical reception. Some art history recommended but not required. HU

HSAR 237b / EAST 237b, Arts of China Staff

Arts of China is a window to the nation’s history, culture, society, and aesthetics. This course introduces the visual arts of China from the prehistoric period to the twentieth century. We look at the archaeological findings (including pottery, jade, and bronze vessels) as well as ancestor worship and belief in posthumous souls and immortal mountains. We look at the art and architecture inspired by Buddhism, Taoism, and Confucianism. We investigate the place of Chinese painting and calligraphy in court and elite cultures and explore how these arts intertwine with politics, printing culture,

and popular culture. Lastly, we investigate the decorative arts, like ceramics, textiles, and furniture, as well as the art and architecture that reflect foreign tastes.

HSAR 243b / ARCG 243b / CLCV 160b, Greek Art and Architecture Milette Gaifman
Monuments of Greek art and architecture from the late Geometric period (c. 760 B.C.) to Alexander the Great (c. 323 B.C.). Emphasis on social and historical contexts. HU

HSAR 250a / ARCG 170a / CLCV 170a, Roman Art: Empire, Identity, and Society
Diana Kleiner

Masterpieces of Roman art from the Republic to Constantine studied in their historical and social contexts. The great Romans and the monuments they commissioned—portraits, triumphal arches, columns, and historical reliefs. The concept of empire and imperial identity, politics and portraiture, the making and unmaking of history through art, and the art of women, children, freedmen, and slaves. HU

* **HSAR 251b / FREN 366b, Writers and Artists in Paris, 1780–1914** Marie-Hélène Girard

Ways in which the transformation of Paris shaped the representation of artists who lived and worked in the French capital from the end of the Old Regime until the eve of World War I. The emergence of Paris as a cultural marker; the role played by the image of the bohemian or the *artiste maudit*. Authors and artists include David, Balzac, Delacroix, Baudelaire, Manet, Mallarmé, impressionist painters, and Picasso. L5, HU

HSAR 252b / ARCG 252b / CLCV 175b, Roman Architecture Diana Kleiner
The great buildings and engineering marvels of Rome and its empire. Study of city planning and individual monuments and their decoration, including mural painting. Emphasis on developments in Rome, Pompeii, and central Italy; survey of architecture in the provinces. HU

HSAR 264b, Constantinople/Istanbul and Venice Robert Nelson
The historical and artistic relationships between the cities of Constantinople/Istanbul and Venice, from the former city's founding in the fourth century until the latter city's absorption into the state of Italy in the nineteenth century. Their competition for dominance in the eastern Mediterranean. HU

HSAR 282b / HSHM 237b / WGSS 282b, Renaissance Bodies: Art, Magic, Science
Marisa Bass

An introduction to issues surrounding the representation of the body in both art and science, spanning from the late Middle Ages to the seventeenth century, and with a particular focus on the Northern Renaissance. Topics include medicine, reproduction, witchcraft, the gender spectrum, torture, race, disability, desire, dreams, and theories of imagination and invention. Sections and assignments will make ample use of the Yale collections. Previous experience with art history welcome but not required. HU

HSAR 293a, Baroque Rome: Painting, Sculpture, Architecture Nicola Suthor
Analyses of masterpieces by prominent artists in baroque Rome. Caravaggio's "baroque" differentiated from the path of the classicist artists. Works by Gian Lorenzo Bernini, who dominated the art scene in Rome as sculptor and architect half a century after Caravaggio's death. HU

HSAR 312b / ARCH 312b, Modern Architecture in a Global Context, 1750-present

Craig Buckley

Architects, movements, and buildings central to the development of modern architecture from the mid eighteenth century through to the present. Common threads and differing conceptions of modern architecture around the globe. The relationship of architecture to urban transformation; the formulation of new typologies; architects' responses to new technologies and materials; changes in regimes of representation and media. Architects include Claude Nicolas Ledoux, Giovanni Battista Piranesi, John Soane, Frank Lloyd Wright, Le Corbusier, Ludwig Mies van der Rohe, Lina Bo Bardi, Louis Kahn, and Kenzo Tange. HU

HSAR 326a / ARCH 260a, History of Architecture I: Antiquity to the Baroque Kyle

Dugdale

The first half of a two-term sequence in the history of architecture. Architecture and urbanism from ancient Egypt through Greek and Roman classical traditions to the Enlightenment. The formal expression – organizational, structural, and ornamental – and social context of specific buildings and urban areas. Architecture as a form of social expression that builds on its own stylistic development, articulating a response to changes in history and culture. Emphasis on Western architecture, with selections from other parts of the world. HU

HSAR 343a, The History of Photography Carol Armstrong

Overview of the history of still photography from its inception in 1839 to the present. Focus on significant developments in England, France, Germany, Russia, and the United States. HU

HSAR 375a / AFAM 183a, Afro-Modernism in the Twentieth Century Kobena Mercer

Introductory survey of African American, Caribbean, and black British artists in the context of modernism and postmodernism. Cross-cultural dynamics in the aesthetics and politics of race and representation. HU

HSAR 383b / SAST 374, Sacred Space in South Asia Subhashini Kaligotla

“Sacred” space in the Indian subcontinent was at the epicenter of human experience. This course presents Buddhist, Hindu, Islamic, and Jain monuments and the gamut of social meanings and activities associated with them. Moving from the ritual spaces of the Indus Valley Culture to nineteenth-century colonial India, we learn how the organization and imagery of these spaces supported devotional activity and piety. We learn too how temples, monasteries, and shrines supported the pursuit of pleasure, amusement, sociability, and other worldly interests. We also explore the symbiotic relationship between Indian kingship and religion, and the complex ways in which politics and court culture shaped sacred environments. The course concludes with European imaginings of Indian religion and religious places. HU

*** HSAR 399b / HIST 289Jb / HSHM 407b / HUMS 220b, Collecting Nature and Art in the Preindustrial World** Paola Bertucci

A history of museums before the emergence of the modern museum. Focus on: cabinets of curiosities and Wunderkammern, anatomical theaters and apothecaries' shops, alchemical workshops and theaters of machines, collections of monsters, rarities, and exotic specimens. WR, HU

* **HSAR 401a or b, Critical Approaches to Art History** Staff

A wide-ranging introduction to the methods of the art historian and the history of the discipline. Themes include connoisseurship, iconography, formalism, and selected methodologies informed by contemporary theory. WR, HU

* **HSAR 410a / AMST 332a, Humbugs and Visionaries: American Artists and Writers Before the Civil War** Bryan Wolf

This course examines American literature and visual culture of the seventeenth, eighteenth, and nineteenth centuries. We look in particular at outliers, prophets, and self-promoters, from the radical Puritan writer Anne Bradstreet to popular entertainers like P. T. Barnum. Topics include: visibility and the public sphere; landscape and politics; genre painting and hegemony; race and identity; managerial culture and disembodied vision. Class trips to the Yale University Art Gallery and the Metropolitan Museum (New York). HU

* **HSAR 412b, Material and Meaning in the Ancient Americas** Barbara Mundy

This class examines the materials and technologies used to make art in the Ancient Americas to understand how worldviews are expressed in matter. It covers a wide sweep of indigenous empires (Maya, Aztec, Inca, Olmec, Chavin, Moche) but assumes no previous knowledge of the area. Students explore, hands-on, YUAG objects and learn to write about art for a broad public. HU

* **HSAR 424b / ARCG 424b / CLCV 230b, eClavdia: Women in Ancient Rome** Diana Kleiner

The contributions of Roman women to one of the greatest cities – and one of the greatest empires – in world history. Lost stories of real-life Roman women recovered from public and residential buildings, portraits, paintings, and other works of Roman art and architecture. HU RP

* **HSAR 426a, American Silver** John Gordon

Objects made of silver as important markers of taste and social position in America from the beginning of colonial settlement to the present. The progression of styles, associated technologies, uses, political meanings, and cultural contexts of American silver. Use of objects from the American silver collection of the Yale University Art Gallery. HU

* **HSAR 440a, Issues in Nineteenth-Century Sculpture** Christina Ferando

Survey of nineteenth-century European and American sculpture using concrete visual examples from Italy, France, England, and the United States to examine the formal structure of sculpture and contextualize the social and political circumstances of its production and reception. Focus on representation of the human figure and examination of issues of idealism and naturalism, as well controversies surrounding the use of color and gender/class signifiers. Use of collections in the Yale University Art Gallery and the Yale Center for British Art. Some familiarity with art history is helpful. HU

* **HSAR 442b, Style** Nicola Suthor

This seminar mines the concept “style,” one of the key terms of art history and aesthetic theory which has fallen into disrepute for several decades but has resurged again strongly in recent years. The seminar considers the difficulties of and disagreements about whether it is something to strive for or to avoid. The focus is on the long lasting impact the concept has had on how we think about artistic creation and perception,

makes sense of the diversity of artistic production, and imagines cultural identities. Notions of individual, national, and period style are explored in tandem with how the term has been used to create formal taxonomies and historical timelines. This course cultivates in students the ability to synthesize diverse readings from various times and places and applies these to actual works of art. Class is limited to 14 students. Preference is given to art history or architecture majors, but students majoring in other disciplines are welcome.

*** HSAR 447b, Epic India: The Rama Story in Visual Art** Subhashini Kaligotla

The epic story of Rama (*Ramayana*) is one of the most influential tales of the Indian subcontinent. It has been told and experienced in a stunning range of media across time and space: from epic verse and lyric poetry to painting, film, graphic novels, and puppet theater. While Valmiki's Sanskrit *Ramayana* of ca. 500 BCE is acknowledged as the first, writers have recounted the tale in the polyglot array of Indic languages, from Kashmiri to Telugu, and infused it with the values and interests of their own time and place. The story's flexibility and capaciousness has encouraged social contestation and given voice to the concerns of disenfranchised social groups, including women and Dalits. This seminar examines a generous array of South Asia's visual *Ramayana* traditions from the ancient to the modern, encompassing temple relief sculpture, painted courtly manuscripts, and comic book and filmic *Ramayan*s. Reading a selection of primary texts alongside we consider this tale's immense capacity to represent the gamut of human experience, both private and public, and its continued resonance for artists, writers, performers, and their publics. Prerequisite: At least one introductory course in Art History. HU

*** HSAR 448a, The Long 1960s: Art, Revolution, Politics** Pamela Lee

Consideration of the art and visual culture of the "Long 1960s," treating the art of this pivotal decade against the backdrop of the global Cold War. We consider the most significant art movements of the period (Pop, minimal art, conceptual art etc.) alongside debates on the relationship between art, revolution, and politics both within the United States and abroad. Topics include the rise of media culture and its impact on art; the global reception of Pop; Black Power and the Black Arts Movement; art and activism of the New Left; the counterculture and new media; the aesthetics of Third Worldism and the anti-war movement; 1968 and the Society of the Spectacle; and gay liberation at Stonewall. Mandatory weekend field trip to Washington DC. Some art history recommended, but not required. Enrollment is restricted and by application. Contact instructor for details. HU

*** HSAR 450b, Victorian Radicals** Tim Barringer and Martina Droth

The course is taught to coincide with an exhibition *Victorian Radicals* at the Yale Center for British Art. It argues that Pre-Raphaelites and the Arts and Crafts Movement were a major avant-garde forces in nineteenth century art and literature. Classes examine the visual and literary responses to industrialization and urbanization in the works of the Pre-Raphaelite Brotherhood, their associates and followers, in cultural context of Victorian Britain. The course pursues a range of methods for the historical interpretation of material objects such as textiles, stained glass, metalwork, and furniture, as well as some of the most important paintings, drawings, prints, and book illustrations of the Victorian era. We also examine poems and prose works, placing them in the context of broader arguments about modernity, the city, and the role of the image in the age of mechanical reproduction. Finally, the class focuses on the process of

selecting and mounting an exhibition and the ways in which the physical presentation of objects can achieve different goals from written analysis. HU

* **HSAR 455a, Conceptualization of Space** Craig Buckley

Introduction to the discipline of architecture through the elusive concept of space. This course traces key shifts in the conceptualization of space in aesthetics and architectural theory from the eighteenth century through to the present. HU

* **HSAR 458a / FREN 400a / HUMS 415a, The Worlds of Chartres Cathedral**

Jacqueline Jung and R. Howard Bloch

An exploration of Chartres Cathedral as a meeting point of various artistic, technological, ritual, literary, intellectual, and social trends in the High Middle Ages. We study what went into building this "chief sanctuary of the Virgin in Western Europe," how the cathedral fit into and changed the world around it, Gothic design and construction, and the literature connected to Chartres as well as to the urban centers of northern France in the twelfth and thirteenth centuries. Topics include: the pre-history of the present cathedral; royal, noble, and local patronage; sculptural programs of the west façade and northern and southern portals; stained glass programs of the west wall, nave, transept (great rose windows), and choir; relics; liturgical and affective experiences of Chartres; the cathedral as a physical, sacred and social space; the cult of the Virgin; new learning and the cathedral school; literary works attached to the Charlemagne window (*The Song of Roland*, *The Pilgrimage of Charlemagne*, *The Pseudo-Turpin*), to the cathedral more generally (The Miracles of Our Lady of Chartres), to the towns of medieval France (Fabliaux); renovation and restoration of post-medieval Chartres. HU

* **HSAR 466a, The Technical Examination of Art** Staff

Introduction to methods used in the technical examination of works of art, including critical assessment of the information such methods provide. What technical examination can reveal about the materials and techniques used in a particular work's creation and about its subsequent history.

* **HSAR 469a / EAST 469a, Contemporary Art and Culture in China** Staff

This course is an introduction to the art and culture of contemporary China, covering the period from 1960s to the present day. It focuses on art objects, performances, propaganda, and exhibitions produced by the government, the business sector, curators, and avant-garde artists in Mainland China. We also look at China's Olympic stadiums, the Three Gorges Dam, and skyscrapers (including those in Hong Kong and Taiwan). Class meetings discuss the required readings and investigate artworks, films, and events that speak to China's political ideologies, society, and economy, as well as its role in globalization and international conflicts. To establish a cross-cultural interpretation, this class also explores how Euro-American artists and filmmakers used their arts to express their views on contemporary China.

* **HSAR 472b / AFAM 353b, Black British Art and Culture** Kobena Mercer

Introduction to black British visual artists and cultural theorists, with a focus on those of African, Caribbean, and South Asian descent. Postcolonial perspectives on diaspora identities and cross-cultural aesthetics in art, film, and photography from 1945 to the present. HU

* **HSAR 478b, Paint** Mark Aronson

The evolution, materiality, and life-cycle of paint, from the workshop to the art shop, is the subject of this part studio, part gallery seminar. The character of paint, its manipulation and role as an artistic vehicle is explored using objects in Yale's collections. Students spend equal time painting, gallery viewing, and researching. The filters of age, framing, interpretation, and restoration are considered. Guided by artists' accounts and painting manuals, students make various types of paint using historical and modern colorants, and implement techniques that have endured and punctuated Western art, testing the 'rules' of painting and traditional workshop practices while exploiting the material's expressive potential through experimentation.

* **HSAR 479b / ENGL 223b, Blake and Milton** John Rogers

An interdisciplinary exploration of the Romantic poet William Blake and his literary and visual engagements with the work of the Renaissance poet John Milton. Relying on the unique Blake holdings at the Yale Center for British Art, the course considers not only Blake's Milton, but Blake's artistic and textual treatments of other early modern writers, including Shakespeare, Bacon, Bunyan, and Newton. WR, HU

* **HSAR 484b / EAST 474b, Japanese Screens** Mimi Yiengpruksawan

The screen-painting tradition in Japan, particularly as it emerged in the sixteenth and seventeenth centuries. The format, techniques, and functions of screen painting; poetic and literary connections, as well as studio practices and politics, of the principal lineages of painters; aesthetics and styles associated with varying classes of patronage, from the shoguns to Buddhist monks to the Japanese court. HU

* **HSAR 490a / FILM 320a, Close Analysis of Film** Oksana Chefranova

The goal of this intensive seminar is to develop tools of close analysis of film as a significant art form by learning to identify elements of cinematic representation (mise-en-scène, cinematography, editing, sound, and the basic vocabulary associated with each aspect) and to demonstrate how these constituents combine to create meaning. Through developing a deeper understanding of a particular film, we transition from specific instances to broader considerations such as aesthetic and historical context or ideological critique. The course also traces the history of the close analysis method from structural semiotics and neoformalist analysis to digital humanities. We study films ranging from Hollywood and American filmmaking (Alfred Hitchcock and David Lynch) and European modernism (Robert Bresson and Jean-Luc Godard) to films that use expressive codes and cultural conventions less familiar to us (Lars von Trier and Hou Hsiao-hsien). Topics include genre, the digital image, landscape, body and face, gesture and screen performance, and cinematic atmosphere. Prerequisite: FILM 150.

HU

* **HSAR 498a or b, Independent Tutorial** Marisa Bass

For students who wish to pursue a subject in the history of art not otherwise covered by departmental offerings. May be used for research or directed reading under faculty supervision. A term paper or its equivalent and regular meetings with the adviser are required. To apply for admission, a student should present a prospectus and a bibliography, signed by the adviser, to the director of undergraduate studies. Enrollment limited to History of Art majors.

*** HSAR 499a or b, The Senior Essay** Marisa Bass

Preparation of a research paper (30-35 pages in length) on a topic of the student's choice, under the direction of a qualified instructor, to be written in the fall or spring term of the senior year. In order to enroll in HSAR 499, the student must submit a project statement on the date that their course schedule is due during the term that they plan to undertake the essay. The statement, which should include the essay title and a brief description of the subject to be treated, must be signed by the student's adviser and submitted to the DUS. All subsequent deadlines are also strict, including for the project outline and bibliography, complete essay draft, and the final essay itself. Failure to comply with any deadline will be penalized by a lower final grade, and no late essay will be considered for a prize in the department. Senior essay workshops that will meet periodically throughout the term are also mandatory. Permission may be given to write a two-term essay after consultation with the student's adviser and the DUS. Only those who have begun to do advanced work in a given area and whose project is considered to be of exceptional promise are eligible. The requirements for the one-term senior essay apply to the two-term essay, except that the essay should be 50-75 pages in length.

History of Science, Medicine, and Public Health

Director of undergraduate studies: Ivano Dal Prete (ivano.dalprete@yale.edu), EM 310; hshm.yale.edu

History of Science, Medicine, and Public Health is an interdisciplinary program that focuses on how different forms of knowledge and technology have been created in various times, places, and cultures, and how they have shaped the modern world. The major explores a wide range of questions. For example, is science universal, or does each culture have its own approach to trustworthy knowledge? What is the relationship between medical expertise, social structure, and everyday life? What is the nature of technology and its relationship to political, economic, and military power? Why do even the best public health campaigns have unintended consequences?

Course topics include the Scientific Revolution, medicine and media in modern America, health activism and public health, global health and epidemics, biotechnology, predictions of planetary catastrophe, scientific collections and material culture, and the historical development of the physical, environmental, biological, and human sciences.

A major in History of Science, Medicine, and Public Health offers excellent preparation for a wide range of careers. Premedical students and others interested in health-related fields can combine preprofessional training with a broad humanistic education. The major also provides a solid foundation for any career at the intersection of the sciences, technology, and public life, including law, business, journalism, museum work, public policy, and government.

REQUIREMENTS OF THE MAJOR

The major in History of Science, Medicine, and Public Health requires twelve term courses, including the two-term senior requirement. Students select a pathway of seven courses that guides them through an area of specialization. The seven pathway courses must include two courses in History of Science, Medicine, and Public Health; one seminar numbered 100 or above in History of Science, Medicine, and Public Health or in History; one science course; and three electives chosen from relevant courses in any department.

Pathways The five standard pathways in the major are Medicine and Public Health; Global Health; Science, Technology, and Society; Gender, Reproduction, and the Body; and Media, Knowledge, and Visual Cultures. Students may also design customized pathways in consultation with the director of undergraduate studies (DUS). No later than the beginning of the junior year, students in the major must select a standard pathway or indicate that they wish to design their own.

Electives Beyond the seven pathway courses, students must complete three additional electives in History of Science, Medicine, and Public Health. One of the electives must be a seminar, and one must be chosen from a pathway other than the one selected for the major. All courses for the major are chosen in collaboration with the student's adviser.

Credit/D/Fail A maximum of one History of Science, Medicine, and Public Health course taken Credit/D/Fail before the fifth term of enrollment may be counted toward the requirements of the major.

Roadmap See visual roadmap of the requirements.

SENIOR REQUIREMENT

By the end of reading period in the spring term of the junior year, students choose whether they will work toward a yearlong or a one-term senior project. Yearlong senior projects are completed in HSHM 490, 491; one-term projects are completed in HSHM 492. Students who choose a one-term project must take an additional HSHM-listed course to complete the major. Only students who complete a yearlong senior project are eligible for Distinction in the Major.

For both the one-term and yearlong senior projects, students select a project adviser, propose a tentative topic and title, and submit a proposal to the senior project director. The final product of the senior requirement may be a written essay or an alternative project such as a film, exhibition, catalog, atlas, or historical data reconstruction. In the case of an alternative project, the student must identify a second reader in addition to the adviser before the project is approved by the senior project director. Either the adviser or the second reader must be a member of the faculty in History of Science, Medicine, and Public Health. A written component to the senior project must illustrate sources and the intellectual significance of the project. For more details about requirements and deadlines, majors should consult the HSHM Senior Project Handbook; copies are available from the senior project director and on the program website.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 12 term courses (incl senior req)

Distribution of courses 7 courses in pathway, incl 2 HSHM courses, 1 sem in HSHM or Hist numbered 100 or above, 1 science course, and 3 electives; 3 addtl HSHM electives, incl 1 sem and 1 course outside major pathway

Senior requirement Yearlong project (HSHM 490, 491), or one-term project (HSHM 492) and 1 addtl HSHM elective

FACULTY ASSOCIATED WITH THE PROGRAM OF HISTORY OF SCIENCE, MEDICINE, AND PUBLIC HEALTH

Professors Deborah Coen, Naomi Rogers, John Warner

Associate Professors Paola Bertucci, Joanna Radin, William Rankin

Assistant Professor Carolyn Roberts

Lecturers Sakena Abedin, Ivano Dal Prete, Chitra Ramalingam

Affiliated Faculty Rene Almeling (*Sociology*), Toby Appel (*Yale University Library*), Melissa Grafe (*Yale University Library*), Dimitri Gutas (*Near Eastern Languages & Civilizations*), Ann Hanson (*Classics*), Jessica Helfand (*School of Art*), Marcia Inhorn (*Anthropology*), Kathryn James (*Yale University Library*), Amy Kapczynski (*Law School*), Gundula Kreuzer (*Music*), Amy Meyers (*Yale Center for British Art*), Alan Mikhail (*History*), Ayesha Ramachandran (*Comparative Literature*), Paul Sabin (*History*), Jason Schwartz (*School of Medicine*), Gordon Shepherd (*School of Medicine*), Frank Snowden (*History*), Rebecca Tannenbaum (*History*), R. John Williams (*English*)

Courses

*** HSHM 002a / CLCV 034a / HIST 037a, Medicine and Disease in the Ancient World**

Jessica Lamont

Examination of ancient medicine considering modern fields of pathology, surgery, pharmacology, therapy, obstetrics, psychology, anatomy, medical science, ethics, and education, to gain a better understanding of the foundations of Western medicine and an appreciation for how medical terms, theories, and practices take on different meanings with changes in science and society. All readings in English. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.

HU

*** HSHM 005b / HIST 006b, Medicine and Society in American History** Rebecca

Tannenbaum

Disease and healing in American history from colonial times to the present. The changing role of the physician, alternative healers and therapies, and the social impact of epidemics from smallpox to AIDS. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

HSHM 207a / AMST 236a / EVST 318a / HIST 199a, American Energy History Paul

Sabin

The history of energy in the United States from early hydropower and coal to present-day hydraulic fracturing, deepwater oil, wind, and solar. Topics include energy transitions and technological change; energy and democracy; environmental justice and public health; corporate power and monopoly control; electricity and popular culture; labor struggles; the global quest for oil; changing national energy policies; the climate crisis. HU

HSHM 209a / EVST 209a / HIST 465a, Making Climate Knowledge Deborah Coen

This is a course about *how* humans have come to know what we know about our impacts on the earth's climate and our vulnerability to climate change. When did humans first *know* that their actions, in the aggregate, could transform the planet? Did scientists bear responsibility to warn of these consequences? In what ways has the modern science of climate both appropriated and undermined traditional and indigenous forms of climate knowledge? Students learn to work with the methods of history of science: we analyze science as a social and material process bound to the cultural and epistemological particularities of its historical context, and we examine the political dimensions of historical narratives about the emergence of the theory of global warming. Via hands-on experience with Yale's historical collections, students learn to analyze maps, artifacts, and instruments as historical sources. They also gain familiarity with the methods of environmental history, learning to attend to historical evidence of shifting relationships between humans and non-humans. Finally, students become more attuned to the evidence of climate change around them and more confident in their ability to make climate knowledge for themselves. WR, HU

HSHM 211b / EVST 211b / G&G 211b / HIST 416b, Global Catastrophe since 1750

William Rankin

A history of the geological, atmospheric, and environmental sciences, with a focus on predictions of global catastrophe. Topics range from headline catastrophes such as global warming, ozone depletion, and nuclear winter to historical debates about the age of the Earth, the nature of fossils, and the management of natural resources. Tensions

between science and religion; the role of science in government; environmental economics; the politics of prediction, modeling, and incomplete evidence. HU

HSHM 215a / HIST 140a, Public Health in America, 1793 to the Present Naomi Rogers

A survey of public health in America from the yellow fever epidemic of 1793 to AIDS and breast cancer activism at the end of the past century. Focusing on medicine and the state, topics include quarantines, failures and successes of medical and social welfare, the experiences of healers and patients, and organized medicine and its critics. HU

HSHM 237b / HSAR 282b / WGSS 282b, Renaissance Bodies: Art, Magic, Science Marisa Bass

An introduction to issues surrounding the representation of the body in both art and science, spanning from the late Middle Ages to the seventeenth century, and with a particular focus on the Northern Renaissance. Topics include medicine, reproduction, witchcraft, the gender spectrum, torture, race, disability, desire, dreams, and theories of imagination and invention. Sections and assignments will make ample use of the Yale collections. Previous experience with art history welcome but not required. HU

HSHM 241a / AFAM 170a / HIST 479a, Sickness and Health in African American History Carolyn Roberts

A history of American medicine through the African American experience covering the period of slavery through #BlackLivesMatter. Oriented around the complex dynamics of medical abuse and medical resistance, key themes include medicine and slavery; gender and reproduction; medical experimentation and ethics; the rise of racial science; lynching and vigilante violence; segregation and public health; African-descended approaches to health and healing; the rise of the African American medical profession; and black health activism from slavery to #BlackLivesMatter. HU

HSHM 321b / HIST 244b, The Cultures of Western Medicine: A Historical Introduction John Warner

A survey of Western medicine and its global encounters, encompassing medical theory, practice, institutions, and healers from antiquity to the present. Changing concepts of health, disease, and the body in Europe and America explored in their social, cultural, economic, scientific, technological, and ethical contexts. HU

* **HSHM 406a / HIST 150Ja, Healthcare for the Urban Poor** Sakena Abedin

Exploration of the institutions, movements, and policies that have attempted to provide healthcare for the urban poor in America from the late nineteenth century to the present, with emphasis on the ideas (about health, cities, neighborhoods, poverty, race, gender, difference, etc) that shaped them. Topics include hospitals, health centers, public health programs, the medical civil rights movement, the women's health movement, and national healthcare policies such as Medicare and Medicaid.

* **HSHM 407b / HIST 289Jb / HSAR 399b / HUMS 220b, Collecting Nature and Art in the Preindustrial World** Paola Bertucci

A history of museums before the emergence of the modern museum. Focus on: cabinets of curiosities and Wunderkammern, anatomical theaters and apothecaries' shops, alchemical workshops and theaters of machines, collections of monsters, rarities, and exotic specimens. WR, HU

* **HSHM 415a / HIST 179Ja, Historical Perspectives on Science and Religion** Ivano Dal Prete

The engagement between science and religion from a historical standpoint and a multicultural perspective. The Islamic, Jewish, Buddhist, and Christian traditions; the roots of modern creationism; salvation expectations and the rise of modern science and technology. General knowledge of western and world history is expected. WR, HU

* **HSHM 422a / HIST 467Ja, Cartography, Territory, and Identity** William Rankin
Exploration of how maps shape assumptions about territory, land, sovereignty, and identity. The relationship between scientific cartography and conquest, the geography of statecraft, religious cartographies, encounters between Western and non-Western cultures, and reactions to cartographic objectivity. Students make their own maps. No previous experience in cartography or graphic design required. WR, HU

* **HSHM 433b / HIST 419Jb / WGSS 419b, Gender and Science** Deborah Coen
Exploration of the dual potential of the sciences to reinforce received ideas about gender or to challenge existing sexual and racial hierarchies; the rise of the ideas and institutions of the modern sciences as they have reflected and shaped new notions of femininity and masculinity.

* **HSHM 453b / E&EB 336b / HUMS 336b, Culture and Human Evolution** Gary Tomlinson

Examination of the origins of human modernity in the light of evolutionary and archaeological evidence. Understanding, through a merger of evolutionary reasoning with humanistic theory, the impact of human culture on natural selection across the last 250,000 years. HU, SC

* **HSHM 454a / HIST 445Ja, Natural History in History** Paola Bertucci
The changing meaning and practice of natural history, from antiquity to the present. Topics include: technologies and epistemologies of representation, the commodification of natural specimens and bioprospecting, politics of collecting and display, colonial science and indigenous knowledge, and the emergence of ethnography and anthropology. Students work on primary sources in Yale collections. HU

* **HSHM 465a / HIST 176Ja / WGSS 457a, Reproductive Health, Gender & Power in the U.S.** Ziv Eisenberg

This seminar examines women's and men's reproductive health in the United States from the 19th century to the present. How have gender norms and social power structures shaped medical knowledge, scientific investigation, political regulation, and private reproductive experiences? What do the lessons of the history of reproductive health tell us about contemporary policy, legal and economic debates? Topics include abortion, activism, childbirth, contraceptives, eugenics, feminism, fertility, medicalization, pregnancy, reproductive science and technology, sexual health, social justice, and sterilization. WR, HU

* **HSHM 468b / HIST 260Jb, Sex, Life, and Generation** Ivano Dal Prete

Theories and practices of life, sex, and generation in Western civilization. Politics and policies of conception and birth; social control of abortion and infanticide in premodern societies; theories of life and gender; the changing status of the embryo; the lure of artificial life. WR, HU

*** HSHM 471a or b, Directed Reading** Staff

Readings directed by members of the faculty on topics in the history of science, medicine, or public health not covered by regular course offerings. Subjects depend on the interests of students and faculty. Weekly conferences; required papers.

*** HSHM 473b / HIST 403Jb, Vaccination in Historical Perspective** Jason Schwartz

For over two centuries, vaccination has been a prominent, effective, and at times controversial component of public health activities in the United States and around the world. Despite the novelty of many aspects of contemporary vaccines and vaccination programs, they reflect a rich and often contested history that combines questions of science, medicine, public health, global health, economics, law, and ethics, among other topics. This course examines the history of vaccines and vaccination programs, with a particular focus on the 20th and 21st centuries and on the historical roots of contemporary issues in U.S. and global vaccination policy. Students gain a thorough, historically grounded understanding of the scope and design of vaccination efforts, past and present, and the interconnected social, cultural, and political issues that vaccination has raised throughout its history and continues to raise today. HU

*** HSHM 475b / HIST 128Jb, Race and Disease in American Medicine** Sakena Abedin

An exploration of the history of race and disease in American medicine from the late 19th century to the present, focusing on clinical practice and clinical research. We discuss cancer, psychiatric disease, sickle cell disease, and infectious diseases including tuberculosis and HIV. We examine the role of race in the construction of disease and the role of disease in generating and supporting racial hierarchies, with special attention to the role of visibility and the visual in these processes. We also consider the history of race and clinical research, and the implications of racialized disease construction for the production of medical knowledge. WR, HU

*** HSHM 479b / EVST 368b / HIST 491Jb / RLST 368b, The History of the Earth from Noah to Darwin** Ivano Dal Prete

Young earth creationism and flood geology have long been among the most divisive features of American culture and politics. Yet a basic postulate is shared across the spectrum: for better or worse, the old age of the Earth is regarded as the recent product of a secular science, consistently rejected by traditional Christianity. This seminar challenges this long-established narrative, by uncovering the surprising boldness, complexity, and societal diffusion of pre-modern debates on the history of the Earth, and of humankind itself. Students have opportunity to explore the nature, assumptions, and methods of Earth sciences before the advent of modern geology, to question ingrained assumptions about their relation to religion and society, and to place outstanding issues into historical perspective. How have the great monotheistic religions dealt with the possibility of an ancient Earth? Was a young creation always important in traditional Christianity? If not, what led to the emergence of young Earth creationism as a force to be reckoned with? What are the intellectual roots of American preadamism, which claims that the black and white races were created at different times and do not descend from the same ancestor? These and other questions are addressed not only through scholarly literature in the field, but also with the analysis of literary, visual, and material sources available on campus. WR, HU

*** HSHM 481a / AFAM 213a / HIST 383Ja, Medicine and Race in the Slave Trade**

Carolyn Roberts

Examination of the interconnected histories of medicine and race in the slave trade. Topics include the medical geography of the slave trade from slave prisons in West Africa to slave ships; slave trade drugs and forced drug consumption; mental and physical illnesses and their treatments; gender and the body; British and West African medicine and medical knowledge in the slave trade; eighteenth-century theories of racial difference and disease; medical violence and medical ethics. WR, HU

*** HSHM 490a or b and HSHM 491a or b, Yearlong Senior Project** Carolyn Roberts

Preparation of a yearlong senior project under the supervision of a member of the faculty. There will be a mandatory meeting at the beginning of the term for students who have chosen the yearlong senior project; students will be notified of the time and location by e-mail before classes begin. Majors planning to begin their projects who do not receive this notice should contact the senior project director. Students expecting to graduate in May enroll in HSHM 490 during the fall term and complete their projects in HSHM 491 in the spring term. December graduates enroll in HSHM 490 in the spring term and complete their projects in HSHM 491 during the following fall term. Majors planning to begin their projects in the spring term should notify the senior project director by the last day of classes in the fall term. Students must meet progress requirements by specific deadlines throughout the first term to receive a temporary grade of SAT for HSHM 490, which will be changed to the grade received by the project upon the project's completion. Failure to meet any requirement may result in the student's being asked to withdraw from HSHM 490. For details about project requirements and deadlines, consult the HSHM Senior Project Handbook. Students enrolled in HSHM 491 must submit a completed project to 211 HGS no later than 5 p.m. on April 6, 2018, in the spring term, or no later than 5 p.m. on December 1, 2017, in the fall term. Projects submitted after 5 p.m. on the due date without an excuse from the student's residential college dean will be subject to grade penalties. Credit for HSHM 490 only on completion of HSHM 491.

*** HSHM 492a or b, One-Term Senior Project** Carolyn Roberts

Preparation of a one-term senior project under the supervision of an HSHM faculty member, or of an affiliated faculty member with approval of the director of undergraduate studies. There will be a mandatory meeting at the beginning of the term for students who have chosen the one-term senior project; students will be notified of the time and location by e-mail before classes begin. Majors planning to begin their projects who do not receive this notice should contact the senior project director. Students expecting to graduate in May enroll in HSHM 492 during the fall term. December graduates enroll in HSHM 492 in the preceding spring term. Students planning to begin their project in the spring should notify the senior project director by the last day of classes in the fall term. Majors must submit a completed Statement of Intention form signed by the faculty member who has agreed to supervise the project to the HSHM administrator no later than September 9, 2019 (HSHM 492a), or January 17, 2020 (HSHM 492b). Blank statement forms are available in the HSHM Senior Project Handbook on the HSHM website. Students enrolled in HSHM 492 must submit a completed senior project to the HSHM administrator no later than 5 p.m. on December 2, 2019, in the fall term, or no later than 5 p.m. on April 6, 2020, in the

spring term. Projects submitted after 5 p.m. on the due date without an excuse from the student's residential college dean will be subject to grade penalties.

Human Rights Studies

Program director: James Silk (humanrights.program@yale.edu), L39 SLB, 432-1729; humanrights.yale.edu

ADVISORY COMMITTEE FOR THE MULTIDISCIPLINARY ACADEMIC PROGRAM IN HUMAN RIGHTS STUDIES

Ned Blackhawk (*History*), Amity Doolittle (*School of Forestry, Environmental Studies*), Crystal Feimster (*African American Studies, American Studies*), Moira Fradinger (*Comparative Literature*), Inderpal Grewal (*Women's, Gender, & Sexuality Studies*), Paul Linden-Retek (*Law School, Political Science*), Talya Lockman-Fine (*Law School*), Louisa Lombard (*Anthropology*), Hope Metcalf (*Law School*), Alice Miller (*Law School, Public Health*), Samuel Moyn (*Law School, History*), Jill Richards (*English*), Thania Sanchez (*Political Science*), James Silk (*Law School*), David Simon (*Political Science*), Quan Tran (*Ethnicity, Race, and Migration, American Studies*), Elisabeth Wood (*Political Science*), Jonathan Wyrzten (*Sociology*)

HUMAN RIGHTS STUDIES MULTIDISCIPLINARY ACADEMIC PROGRAM

The Multidisciplinary Academic Program in Human Rights Studies presents human rights as a rich and interdisciplinary field of study. The program provides students with the analytical, conceptual, and practical skills necessary for human rights study; connects students to affiliate faculty and peers; supports student research projects and internships; and offers career guidance in the field.

Students apply to the Multidisciplinary Academic Program in Human Rights Studies during the fall term of the sophomore year. They also complete the requirements of a Yale College major. Yale College does not offer a major in human rights.

To fulfill the requirements of the program, students complete a gateway course (HMRT 100), four electives, and a capstone seminar (HMRT 400), which entails completion of a final capstone project. The gateway course equips students with the theoretical tools necessary for studying human rights, their evolution, and their justification. It introduces a number of contemporary issues such as gender disparities, racial discrimination, climate change, global health, human trafficking, refugees, world poverty, and humanitarian intervention. Students select four electives from a list of eligible courses provided at the start of each term. In the capstone seminar, students explore advanced issues in international human rights law and advocacy and complete a supervised research project that is informed by extracurricular experience and developed in consultation with the program director and other program advisers.

Students are also expected to submit three reflections on Schell Center human rights events during the spring term of their sophomore year and one event reflection each term thereafter, and attend program events and gatherings, including weekly dinners during the sophomore spring term and junior fall term.

Additional information is available at the Human Rights program website.

REQUIREMENTS OF THE PROGRAM

Prerequisite None

Number of courses 6 courses

Specific courses required HMRT 100

Other requirements 4 electives and event reflections as described

Senior requirement HMRT 400

Courses

* **HMRT 400a, Advanced Human Rights Colloquium** Staff

This course is the culminating seminar for Yale College seniors in the Multidisciplinary Academic Program in Human Rights (Human Rights Scholars). The goal of the colloquium is to help students conceive and produce a meaningful capstone project as a culmination of their work in the program. It is a singular opportunity for students to pursue in-depth research in human rights. Open only to Human Rights Scholars in their senior year and a requirement for completing the program.

Humanities

Director of undergraduate studies: Norma Thompson (norma.thompson@yale.edu), Whitney Humanities Center, 53 Wall St., 432-1313; chair: Bryan Garsten (bryan.garsten@yale.edu), 53 Wall St., 432-0670; humanities.yale.edu

The undergraduate program in Humanities provides students the opportunity to integrate courses from across the humanistic disciplines into intellectually coherent and personally meaningful courses of study. Works of literature, music, history, philosophy, and the visual arts are brought into conversation with one another and with the history of ideas.

The major in Humanities asks students to begin with broad surveys of foundational works in at least two different cultural traditions, including at least one course on classical Western European texts. All majors take two specially commissioned core seminars, each co-taught by two faculty members from different, complementary fields of study. After taking these core seminars, students in the major share a broad grounding in several cultural traditions, the experience of having grappled with the question of what "modernity" is, and the experience of having spent a term interpreting a single work (or small corpus of works) in great depth. Students then craft an area of concentration according to their interests and with the help of appropriate faculty members. The major offers breadth and interdisciplinary scope even as it encourages depth and intellectual coherence.

COURSES FOR NONMAJORS

Students in all classes can find options in the varied course offerings, from special seminars for first-year students to the Franke and Shulman Seminars for seniors. Many courses are open to nonmajors.

REQUIREMENTS OF THE MAJOR

The major for the Class of 2021 and subsequent classes In addition to the fourteen term courses as listed here, majors are required to keep an intellectual journal.

Fourteen term courses are required for the major, including three "foundational works" surveys, two core seminars, one course in each of four areas of study in the humanities (which may include the Franke and Shulman Seminars), four additional electives selected to complement the student's area of concentration and approved by the director of undergraduate studies (DUS), and a one- or two-term senior essay. Majors are also required to keep an intellectual journal and are strongly encouraged to enroll in at least one term course in literature in a foreign language.

Foundations Three broad surveys of foundational works in any cultural tradition are required, such as HIST 280, EALL 200, or RLST 189. One or two foundations courses must be in the classical tradition of Western Europe, such as Directed Studies, or ENGL 129 or CLCV 256.

Core seminars The major requires two core seminars, one in "Modernities" and one in "Interpretations." Each core seminar is taught by a pair of faculty members from complementary disciplines. The two broad themes of the seminars remain consistent

from year to year, but the material studied and the faculty members teaching change, allowing each class of students to explore the themes in different ways.

Areas of study in the humanities One course is required in each of four areas: literature; visual, musical, or dramatic arts; science in the humanities; and intellectual history and historical analysis. Courses may be drawn from any department or program in Yale College, with the approval of the DUS.

Intellectual journal In an effort to spark integrative thinking across a student's various courses and extra-curricular commitments, students are encouraged to log entries outlining particularly striking moments in their intellectual lives, whether in courses or outside of them, and are encouraged to keep track of questions they would like to pursue in their studies, insights they come across, and projects they envision for themselves in the future, including possible senior essay topics. Students must submit a minimum of one journal entry each semester to the DUS. At the completion of their studies, students will receive a hard copy of their journal.

SENIOR REQUIREMENT

A one- or two-term senior essay is required (HUMS 491).

ADVISING

Students are expected to declare their intent to major in Humanities in a meeting with the DUS before their junior year.

UNIQUE TO THE MAJOR

The Franke Seminar and the Shulman Seminar Sponsored by the Whitney Humanities Center and designed to speak across disciplinary lines to broad public and intellectual issues, the Franke Seminar and the Shulman Seminar each include a series of coordinated public lectures. The seminars are for enrolled students; the lecture series are open to the Yale and local communities. Humanities majors may enroll in a Franke or a Shulman Seminar with permission of the DUS and the instructor.

Summer program in Rome Humanities majors who take the spring-term course HUMS 444, *The City of Rome* (or its equivalent, with instructor approval), and develop individual research topics to be pursued in Rome may apply for enrollment in a two-credit summer course offered by Yale Summer Session. Museums, archaeological sites, churches, piazzas, libraries, and the city itself are part of the classroom for the summer course. Further information is available on the Humanities program website and the Yale Summer Session website.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Intellectual journal A minimum of one journal entry every term

Number of courses 14 term courses (incl senior essay)

Distribution of courses 3 foundations courses; 2 core sems, as specified; 1 course in each of 4 disciplinary areas; 4 electives in concentration

Senior requirement Senior essay (HUMS 491)

FACULTY ASSOCIATED WITH THE PROGRAM OF HUMANITIES

Professors Jeffrey Alexander (*Sociology*), R. Howard Bloch (*French*), Harold Bloom (*Humanities*), Edyta Bojanowska (*Slavic Languages & Literatures*), Leslie Brisman

(*English*), David Bromwich (*English*), Rüdiger Campe (*German*), Francesco Casetti (*Humanities*), Deborah Coen (*History of Science and Medicine, History*), Stephen Davis (*Religious Studies, History*), Wai Chee Dimock (*English*), Carlos Eire (*History, Religious Studies*), Paul Freedman (*History*), Kirk Freudenburg (*Classics*), Bryan Garsten (*Political Science*), Marie-Hélène Girard (*French*), Phyllis Granoff (*Religious Studies*), Emily Greenwood (*Classics*), David Grewal (*School of Law, Political Science*), Inderpal Grewal (*Women's, Gender, and Sexuality Studies, American Studies*), Frank Griffel (*Religious Studies*), Christine Hayes (*Religious Studies, Judaic Studies*), Alice Kaplan (*French*), Anthony Kronman (*School of Law*), Tina Lu (*East Asian Languages & Literatures*), Ivan Marcus (*History, Religious Studies*), Stefanie Markovits (*English*), Giuseppe Mazzotta (*Italian*), Samuel Moyn (*History, School of Law*), Paul North (*German*), John Durham Peters (*English, Film & Media Studies*), Brigitte Peucker (*German*), Pierre Saint-Amand (*French*), Maurice Samuels (*French*), Steven Smith (*Political Science, Philosophy*), Nicola Suthor (*History of Art*), Gary Tomlinson (*Music, Humanities*), Shawkat Toorawa (*Near Eastern Languages and Civilizations*), Katie Trumpener (*Comparative Literature*), Jing Tsu (*East Asian Languages & Literatures*), Miroslav Volf (*Divinity School*), Anders Winroth (*History*), Ruth Yeazell (*English*)

Associate Professors Paola Bertucci (*History, History of Science, Medicine, and Public Health*), Toni Dorfman (*Adjunct*) (*Theater Studies*), Moira Fradinger (*Comparative Literature*), Milette Gaifman (*History of Art, Classics*), Martin Hägglund (*Comparative Literature, Humanities*), Jacqueline Jung (*History of Art*), Brian Kane (*Music*), Noreen Khawaja (*Religious Studies*), Pauline LeVen (*Classics*), Karuna Mantena (*Political Science*), Joanna Radin (*History of Medicine, History*), Marci Shore (*History*), Kirk Wetters (*German*)

Assistant Professors Marisa Bass (*History of Art*), Lucas Bender (*East Asian Languages and Literatures, Humanities*), Marijeta Bozovic (*Slavic Languages & Literatures*), Molly Brunson (*Slavic Languages & Literatures*), Thomas C. Connolly (*French*), Emily Erikson (*Sociology*), Marta Figlerowicz (*Comparative Literature, English*), Seth Jacobowitz (*East Asian Languages and Literatures*), Isaac Nakhimovsky (*History*), Joseph North (*English*), Giulia Oskian (*Political Science*), Christiana Purdy Moudarres (*Italian*), Ayesha Ramachandran (*Comparative Literature*), Katrin Truedstedt (*German*)

Senior Lecturers Peter Cole (*Judaic Studies*), Charles Hill (*Humanities*), William Klein (*Humanities*), Pauline Lin (*East Asian Languages & Literatures*), Stuart Semmel (*History, Humanities*), Kathryn Slanski (*Humanities, Near Eastern Languages & Civilizations*), Norma Thompson (*Humanities*)

Lecturers Maria Baffi (*Humanities, Spanish & Portuguese*), Brianne Bilsky (*Humanities*), Karla Britton (*Divinity School*), Drew Collins (*Divinity School*), Matthew Croasmun (*Divinity School*), Jonathan Fine (*Humanities*), Andrew Forsyth (*Religious Studies*), Johanna Fridriksdottir (*Humanities*), Joseph Gordon (*English*), Angela Gorrell (*Center for Faith and Culture*), Virginia Jewiss (*Humanities*), Katja Lindskog (*English*), Camille Lizarribar (*Humanities*), Judith Malafronte (*Music*), Karin Roffman (*Humanities, English*), George Syrimis (*Hellenic Studies*), Adam Van Doren (*School of Art*)

Seminars for First Years

Directed Studies is an interdisciplinary introduction to influential texts that have shaped Western civilization.

*** HUMS 071a, Intellectual Circles** Charles Hill

Study of the creative interactions produced by informal associations of innovative minds in literature, philosophy, politics, science, psychology, the arts, war, and law. Courtiers, advisors, disciples, and disputers around Confucius, Socrates, Lincoln, Freud, Wittgenstein, and Niebuhr are among the circles considered. Groups include American Founders, quantum physicists, computer scientists, Gertrude Stein's "Lost Generation" of Americans in Paris, "The Georgetown Set" of Cold War friends and rivals, and the Supreme Court. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

*** HUMS 072b / ENGL 023b, Reading Recent North American Short Fiction** Joseph Gordon

The short story is generally considered to be North American in origin. As one of its goals, the course examines the ways in which the genre has developed in recent decades into a vehicle for storytelling from marginalized or subaltern voices such as those of people of color, women, LGBT people, immigrants and refugees, war veterans, students, and children. The course also explores how collections of stories gathered by a single author may resemble but yet be distinguishable from novels, and examines some very recent short stories that are influenced by nontraditional forms of writing, such as graphic fiction, self-help manuals, and social media. Authors are likely to include: Grace Paley, Alice Munro, Margaret Atwood, Raymond Carver, Lucia Berlin, Sherman Alexie, Tao Lin, Lydia David, Jhumpa Lahiri, Edward P. Jones, Elizabeth Strout, Junot Diaz, Phil Klay, Viet Thanh Nguyen, Alison Bechdel, Nathan Englander, Kristen Rupenian, Jennifer Egan, and Teju Cole. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

*** HUMS 075a, Mastering the Art of Watercolor** Adam Van Doren

An introductory course on the art of watercolor as a humanistic discipline within the liberal arts tradition. Readings, discussions, and studio work emphasize critical, creative thinking through a tactile, "learning by doing" study of the watercolor medium. Students analyze and imitate the classic techniques of J. M.W. Turner, John Singer Sargent, Georgia O'Keeffe, and Edward Hopper, among others. Studio components include painting *en plein air* to understand color, form, perspective, composition, and shade and shadow. Basic drawing skills recommended. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU RP

*** HUMS 083b / ENGL 030b, Fantasy in Literature and Film** Alfred Guy

Study of how fantasy ideas about race and gender, good and evil, and religion and culture reflect and influence changing ideas about what it means to be human. Authors include Neil Gaiman, Ursula K. LeGuin, Octavia Butler, & Nalo Hopkinson. Major fantasy films include *Prisoner of Azkaban* and *Get Out*. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

*** HUMS 094a, The Two Cultures: Science and the Humanities** Brianne Bilsky

The relationship between the sciences and the humanities has never been a comfortable one. Nearly sixty years ago, C. P. Snow, a British physical chemist and novelist,

commented on this uneasiness in his now famous work, *The Two Cultures*. Snow argued that the rift between scientists and literary scholars prevented modern societies from solving many of their problems. But what happens when science and the humanities actually do come together? What might be gained by putting these seemingly disparate ways of understanding the world in conversation with each other? This first-year seminar considers such questions by looking at several intersections between science and the humanities throughout the twentieth and twenty-first centuries. These intersections include: astrophysics and religion; modern science and modernist literature; quantum mechanics and postmodernism; and medicine and ethics. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

Core Seminars

Humanities Electives

HUMS 128a / NELC 128a, From Gilgamesh to Persepolis: Introduction to Near Eastern Literatures Kathryn Slanski

This lecture course is an introduction to Near Eastern civilization through its rich and diverse literary cultures. We read and discuss ancient works, such as the *Epic of Gilgamesh*, *Genesis*, and “The Song of Songs,” medieval works, such as *A Thousand and One Nights*, selections from the *Qur’an*, and *Shah-nama: The Book of Kings*, and modern works of Israeli, Turkish, and Iranian novelists and Palestinian poets. Students complement classroom studies with visits to the Yale Babylonian Collection and the Beinecke Rare Book and Manuscript Library, as well as with film screenings and guest speakers. Students also learn fundamentals of Near Eastern writing systems, and consider questions of tradition, transmission, and translation. All readings are in translation. WR, HU

* **HUMS 130a / LITR 130a, How to Read** Ayesha Ramachandran

Introduction to techniques, strategies, and practices of reading through study of lyric poems, narrative texts, plays and performances, films, new and old, from a range of times and places. Emphasis on practical strategies of discerning and making meaning, as well as theories of literature, and contextualizing particular readings. Topics include form and genre, literary voice and the book as a material object, evaluating translations, and how literary strategies can be extended to read film, mass media, and popular culture. Junior seminar; preference given to juniors and majors. HU

HUMS 134a / ENGL 154a / FREN 216a / LITR 194a, The Multicultural Middle Ages
Ardis Butterfield

Introduction to medieval English literature and culture in its European and Mediterranean context, before it became monolingual, canonical, or author-bound. Genres include travel writing, epic, dream visions, mysticism, the lyric, and autobiography, from the Crusades to the Hundred Years War, from the troubadours to Dante, from the *Chanson de Roland* to Chaucer. HU

HUMS 143b / CLCV 205b / HIST 205b, Introduction to Ancient Greek History
Jessica Lamont

An introductory course in Greek history tracing the development of Greek civilization as manifested in political, intellectual, and creative achievements from the Bronze Age

to the end of the classical period. Students read original sources in translation as well as the works of modern scholars. HU

HUMS 144a / CLCV 206a / HIST 217a, The Roman Republic Andrew Johnston

The origins, development, and expansion of Rome from the earliest times to the deaths of Caesar and Cicero. Cultural identity and interaction; slavery, class, and the family; politics, rhetoric, and propaganda; religion; imperialism; monumentality and memory; and the perception and writing of history. Application of literary and archaeological evidence. HU

* **HUMS 149a / ENGL 219a / ITAL 309a / LITR 179a / WGSS 179a, Gender and Genre in Renaissance Love Poetry** Ayesha Ramachandran

Introduction to the poetic genres of lyric, epic, and pastoral in the European Renaissance. Focus on questions of desire, love, and gendered subjectivity. The historical contexts and political uses of discourses of eroticism and pleasure in Italy, Spain, France, and England. Written exercises include poetic imitations of Renaissance texts. HU

* **HUMS 150a, Shakespeare and the Canon: Histories, Comedies, and Poems** Harold Bloom

A reading of Shakespeare's histories, comedies, and poems, with an emphasis on their originality in regard to tradition and their influence on Western representation since the seventeenth century. Secondary readings included. HU

* **HUMS 151b, Shakespeare and the Canon: Tragedies and Romances** Harold Bloom

A reading of Shakespeare's tragedies and romances, with an emphasis on their originality in regard to tradition: *Hamlet*, *Othello*, *King Lear*, *Macbeth*, and *Antony and Cleopatra*, *The Winter's Tale*, and *The Tempest*. HU

* **HUMS 152a, Poetic Influence from Shakespeare to Keats** Harold Bloom

The complexities of poetic influence in the traditions of the English language, from Shakespeare to Keats. HU

* **HUMS 153b, Poetic Influence from Shakespeare to Hart Crane** Harold Bloom

The complexities of poetic influence in the tradition of the English language. Works by Shakespeare, Milton, Wordsworth, Shelley, Keats, Tennyson, Robert Browning, and Yeats, followed by an American sequence of Whitman, Dickinson, Wallace Stevens, and Hart Crane. HU

* **HUMS 162b / FREN 388b, Feminine Voices in French Literature** R. Howard Bloch

An exploration of women's voices in French literature from the Middle Ages to the mid-twentieth century. The specificity of the feminine voice, the plurality of feminine voices, love and sexuality, and social and professional identity. Authors include Marie de France, Marguerite de Navarre, George Sand, Maryse Condé, and Marguerite Duras. Readings and discussion in English. WR, HU

HUMS 176a / HSAR 176a, The Politics of Representation Marisa Bass

This global introductory course surveys how works of art and architecture have responded to political ideals, shaped political life, and galvanized political debate from antiquity to the present. We consider the relation between visual representation and political representation, addressing how artists and architects have responded to the demands of democracy, empire, war, and revolution, and how individuals and communities have reacted with and against the works that they produced. Topics span

from propaganda to public monuments, icons to iconoclasm, civic buildings to border walls, and from the politics of display to political censorship. Ranging from painting, sculpture, prints, and photography to architecture, landscape design, and military fortification, this course aims to de-center ‘western’ notions of artistic achievement in its multi-media and transnational scope. Lectures and assignments emphasize close looking and close reading, skills which are essential to making us better viewers and citizens. Open to all, including those with no prior background in art history. Sections will include visits to collections and sites across Yale campus. HU

HUMS 180a / ITAL 310a / LITR 183a, Dante in Translation Christiana Purdy
Moudarres

A critical reading of Dante's *Divine Comedy* and selections from the minor works, with an attempt to place Dante's work in the intellectual and social context of the late Middle Ages by relating literature to philosophical, theological, and political concerns. No knowledge of Italian required. Course conducted in English. HU

* **HUMS 192a / HIST 299Ja, Intellectuals and Power in Europe** Terence Renaud

The role of intellectuals in politics, with a focus on social, cultural, and political upheavals in Europe during the nineteenth and twentieth centuries. Whether intellectuals betray a higher spiritual calling when they enter politics or merely strive to put their own theories into practice. Modern answers to the question of why ideas and intellectuals matter. HU

HUMS 201b / FREN 240b / LITR 214b, The Modern French Novel Maurice Samuels
and Alice Kaplan

A survey of major French novels, considering style and story, literary and intellectual movements, and historical contexts. Writers include Balzac, Flaubert, Proust, Camus, and Sartre. Readings in translation. One section conducted in French. HU TR

* **HUMS 204a / ENGL 210a, The Drama of Justice and Mercy** Lawrence Manley

An examination of justice, mercy, and the law in drama, film, and writings from disciplines at the intersection of literature, law, ethics, and religion. Reconsidering the usual binaries of convict and victim, self and other, judgment and forgiveness from antiquity to the present, the seminar gives voice to enduring questions about the brokenness of freedom, human rights, and the status of religious belief. Plays by Aeschylus, Shakespeare, Soyinka, and Peter Brook; films by Sidney Lumet, Gavin Hood, and Martin Scorsese; selected readings in philosophy and religion from Plato, Aristotle, the Bible, Montaigne, Hannah Arendt, Martha Nussbaum, and Howard Lesnick; and recent publications on the mass incarceration crisis in the U.S. (Bryan Stevenson's *Just Mercy*; John Pfaff's *Locked In: The True Causes of Mass Incarceration*; Danielle Allen's *Cuz: The Life and Times of Michael A.*). The seminar models a gracious and inclusive learning community, seeking to move past the paralysis that often occurs in well-meaning conversations on politics and controversial social issues. To this end, we welcome students of all backgrounds and majors: theater/performance majors, English majors, non-majors, those with long-standing opinions and insights, and/or those with fresh eyes and genuine interest. WR, HU TR

* **HUMS 205a, Boundaries of the Body in Law and Literature** Camille Lizarribar

The representation of the human body in law and literature. Bodies as physical structures that inhabit multiple realms, including material, cultural, historical, and symbolic. Ways in which humans think about and give meaning to their bodies in

relationship to themselves and to others. Additional sources include film, television, and journalism. WR, HU

* **HUMS 218a / FILM 235a, Storytelling and Contemporary TV** Staff

If Shakespeare were alive today, he would be writing for TV. So would Jane Austen. With the advent of cable, DVDs, the internet, and live streaming, TV—once considered a “vast wasteland”—has become the most dynamic and creative medium for storytelling, attracting talented writers, directors, and actors. This course explores the innovative narrative strategies that have transformed that wasteland into fertile terrain and ushered in a new Golden Age of TV. Careful visual and textual analysis of episodes is complemented by critical readings and comparisons to literature and cinema. We also consider technical and business pressures on the creative process behind today's “complex TV.” The first part of the term focuses on the AMC series *Breaking Bad*. The second part considers episodes from a range of shows in order to highlight the significance of title sequences, pilots, dialogue, subjective narration, jumbled chronology, and problematic endings. The third part examines the HBO series *The Young Pope*, which brings narrative and visual effects from cinema to the small screen.

HU

* **HUMS 220b / HIST 289Jb / HSAR 399b / HSHM 407b, Collecting Nature and Art in the Preindustrial World** Paola Bertucci

A history of museums before the emergence of the modern museum. Focus on: cabinets of curiosities and Wunderkammern, anatomical theaters and apothecaries' shops, alchemical workshops and theaters of machines, collections of monsters, rarities, and exotic specimens. WR, HU TR

* **HUMS 247b / SOCY 352b, Material Culture and Iconic Consciousness** Jeffrey Alexander

How and why contemporary societies continue to symbolize sacred and profane meanings, investing these meanings with materiality and shaping them aesthetically. Exploration of “iconic consciousness” in theoretical terms (philosophy, sociology, semiotics) and further exploration of compelling empirical studies about food and bodies, nature, fashion, celebrities, popular culture, art, architecture, branding, and politics. HU, SO

* **HUMS 252b / AMST 346b / ENGL 235b, Poetry and Objects** Karin Roffman

This course on 20th and 21st century poetry studies the non-symbolic use of familiar objects in poems. We meet alternating weeks in the Beinecke library archives and the Yale Art Gallery objects study classroom to discover literary, material, and biographical histories of poems and objects. Additionally, there are scheduled readings and discussions with contemporary poets. Assignments include both analytical essays and the creation of online exhibitions. WR, HU

* **HUMS 253a / ENGL 346a / RLST 233a, Poetry and Faith** Christian Wiman

Issues of faith examined through poetry, with a focus on modern Christian poems from 1850 to the present. Some attention to poems from other faith traditions, as well as to secular and antireligious poetry. HU

HUMS 255b / RSEE 312b / RUSS 312b, Tolstoy's War and Peace Edyta Bojanowska

A study of Leo Tolstoy's masterpiece *War and Peace* (1865-1869) about Napoleon's 1812 invasion of Russia, in philosophical, historical, and political contexts. All readings and class discussions in English. WR, HU TR

*** HUMS 264a / HIST 256Ja, Imagining the Body Politic: Constitutional Art and Theory from Antiquity to the Present** Staff

Do visual representations of social and political principles have a peculiar power to produce, reproduce, and disturb social and political relations? To what extent might represented principles, with their contradictions and ambiguities, themselves somehow be pictorial, metaphorical, or figurative? This course is an examination of art and metaphorical thinking in the socio-political realm from Plato through Renaissance republicanism to the modern state. HU

*** HUMS 269b / EALL 230b / EAST 242b, Poetry and Ethics Amidst Imperial Collapse**
Lucas Bender

Du Fu has for the last millennium been considered China's greatest poet. Close study of nearly one-sixth of his complete works, contextualized by selections from the tradition that defined the art in his age. Exploration of the roles literature plays in interpreting human lives and the ways different traditional forms shape different ethical orientation. Poetry as a vehicle for moral reflection. All readings are in English. WR, HU

HUMS 270a / CHNS 200a / EALL 200a / EAST 240a, The Chinese Tradition Lucas Bender

An introduction to the literature, culture, and thought of premodern China, from the beginnings of the written record to the turn of the twentieth century. Close study of textual and visual primary sources, with attention to their historical and cultural backdrops. Students enrolled in CHNS 200 join a weekly Mandarin-language discussion section. No knowledge of Chinese required for students enrolled in EALL 200. Students enrolled in CHNS 200 must have L5 proficiency in Mandarin or permission of the course instructor. HU TR

HUMS 277b / HIST 231b, What was Enlightenment? Isaac Nakhimovsky

A survey of eighteenth-century European intellectual life, considered in its social and cultural contexts and with attention to its historical legacies, focusing on responses to emerging global networks of trade, finance, and empire. HU TR

*** HUMS 279a / HIST 286J / HIST 292Ja / PLSC 286a, Democracy and the French Revolution** Isaac Nakhimovsky

The French Revolution of 1789 and its legacies, as viewed through the late-eighteenth-century debates about democracy, equality, representative government, and historical change that shaped an enduring agenda for historical and political thought in Europe and around the world. WR, HU

*** HUMS 287b / HIST 455Jb / WGSS 347b, The Theory and Practice of Resistance**
Terence Renaud

Exploration of the histories and theories of resistance in the modern world. How liberation movements, guerrillas, and oppressed groups appeal to resistance as an organizational strategy and as moral justification. Readings include Kant, Thoreau, Nietzsche, Luxemburg, Lenin, Gandhi, Fanon, Arendt, Marcuse, Foucault, A. Lorde, Said, and J. Butler. Themes include antifascism to terrorism; violence to nonviolence, the New Left to Black Lives Matter. HU TR

*** HUMS 290a / EALL 286a / EAST 261a / LITR 285a / PORT 360a, The Modern Novel in Brazil and Japan** Seth Jacobowitz

Brazilian and Japanese novels from the late nineteenth century to the present. Representative texts from major authors are read in pairs to explore their

commonalities and divergences. Topics include nineteenth-century realism and naturalism, the rise of mass culture and the avant-garde, and existentialism and postmodernism. No knowledge of Portuguese or Japanese required. HU TR

* **HUMS 295a / JDST 223a / PLSC 307a, Trials of Uncertainty** Norma Thompson
Is the demise of the trial at hand? The trial as cultural achievement, considered as the *epitome* of humanistic inquiry, where all is brought to bear on a crucial matter in an uncertain context. Truth may be hammered out or remain elusive, but the expectation in the court case has been that the adversarial mode works best for sorting out evidentiary conundrums. Inquiries into issues of meaning of the trial, its impartiality, and challenges to its durability. The role of character, doubt, and diagnosis explored in Sophocles, Plato, Cicero, Burke, Jane Austen, Tocqueville, and Kafka, as well as in twentieth-century trials, films, documentaries, and twenty-first-century medical narratives. WR, HU TR

HUMS 305b / EALL 308b / PHIL 410b, Sages of the Ancient World Michael Hunter
Comparative survey of ancient discourses about wisdom from China, India, the Near East, Egypt, Greece, and Rome. Topics include teaching, scheming, and dying. HU

* **HUMS 316b, World Order in Liberal Arts** Charles Hill
International security as humanity's primary problem beyond policy methodologies. America's unique place for and against world order seen in classical literature and intellectual forays into Japan, Africa, Palestine, Persia, etc. Kissinger Papers at Yale provide case studies. HU

* **HUMS 317b / GMAN 316b, The Death Sentence: When the State Kills** Paul North
The political, economic, and philosophical figure of the "death sentence," although it has archaic roots, continues to haunt the 21st century. "Capital punishment," often understood as the paradigmatic, final, and ultimate form of sovereign power, forms only the starting point of our inquiry. If it is the case that, as John Locke writes quoting Cicero, *salus populi suprema lex esto* (the safety of the people should be the supreme law), and if, furthermore, this maxim extends in the name of national security up to and including the point where the lives of certain people and populations are thrown into question, then all instances where the state kills, sanctions killing, or benefits directly or indirectly from the killing of its own citizens must be in question in the course. It may seem strange—modern politics, economics, and philosophy all begin from death sentences. The French revolution depended on bloody executions that were "necessary" for founding a new polity. The Atlantic slave trade condemned millions of Africans to death, under economic reasoning, for the benefit of world capitalism. Athens killed the philosopher Socrates because he was dangerous to the polis, and philosophy has enshrined this death sentence as its mythical origin and its most modern moment. We investigate the stories and logics these events have in common. Why does the state kill its own? Why are death sentences necessary for the current complex of state-nation-capital? Why did "barbaric" practices not end with enlightenment, the critique of religion, scientific rationalism, modernization, capitalism? Answers to these questions come from texts in political theory, philosophy, history, and the social sciences. HU

* **HUMS 327a / ENGL 263a, The Victorian Political Novel** Stefanie Markovits
The engagement of the Victorian novel with the world of politics. Emphasis on how systems interact with individual agents to make stories and how methods such as

realism, romance, and the courtship plot portray the mechanics of government. Units on revolution and riot (Dickens and Gaskell), reform (Eliot and Trollope), and anarchy (James and Conrad). WR, HU

* **HUMS 330a / GMAN 227a / LITR 330a / PHIL 402a, Heidegger's Being and Time**

Martin Hägglund

Systematic, chapter by chapter study of Heidegger's *Being and Time*, arguably the most important work of philosophy in the twentieth-century. All major themes addressed in detail, with particular emphasis on care, time, death, and the meaning of being. HU

* **HUMS 336b / E&EB 336b / HSHM 453b, Culture and Human Evolution** Gary

Tomlinson

Examination of the origins of human modernity in the light of evolutionary and archaeological evidence. Understanding, through a merger of evolutionary reasoning with humanistic theory, the impact of human culture on natural selection across the last 250,000 years. HU, SC

HUMS 339a / HIST 271a / RSEE 271a, European Intellectual History since Nietzsche

Marci Shore

Major currents in European intellectual history from the late nineteenth century through the twentieth. Topics include Marxism-Leninism, psychoanalysis, expressionism, structuralism, phenomenology, existentialism, antipolitics, and deconstruction. HU

* **HUMS 342b / ER&M 416b / GMAN 411b / JDST 327b / LITR 406b, World**

Literature Hannan Hever

The concept of world literature, from its origins in eighteenth-century cosmopolitanism represented by Herder and Goethe up to contemporary critical debates (Apter, Casanova, Cheah, Damrosch, Dharwadker, I. Hesse, Moretti, Mufti, Pollock, Said, Spivak). World literature in relation to national literature, German-language, and Jewish literature; translation, untranslatability, the effect of markets, diaspora, politics. Literary critical readings supplemented by exemplary literary texts in multiple genres. Student contributions based on individual linguistic backgrounds. HU

* **HUMS 351a / PLSC 314a, The American Imagination: From the Puritans to the Civil**

War Steven Smith and Anthony Kronman

Interdisciplinary examination of the uniqueness of the American experience from the time of the Puritans to the Civil War. Readings draw on major works of political theory, theology, and literature. HU

* **HUMS 352b / ENGL 272b / HIST 105Jb, American Imagination: From the Gilded**

Age to the Cold War David Bromwich and Bryan Garsten

Survey of major ideas, writings, and cultural movements that have shaped American life and thought from 1880 to 1990. Assignments encompass works of fiction, philosophy, social and political thought, and film. HU RP

* **HUMS 411b, Life Worth Living** Matthew Croasmun and Ryan McAnnally-Linz

Comparative exploration of the shape of the life advocated by several of the world's normative traditions, both religious and nonreligious. Concrete instantiations of these traditions explored through contemporary exemplars drawn from outside the professional religious or philosophical spheres. Readings from the founding texts

of Buddhism, Judaism, Christianity, Islam, Marxism, and utilitarianism. Admission by application. HU

* **HUMS 415a / FREN 400a / HSAR 458a, The Worlds of Chartres Cathedral**

Jacqueline Jung and R. Howard Bloch

An exploration of Chartres Cathedral as a meeting point of various artistic, technological, ritual, literary, intellectual, and social trends in the High Middle Ages. We study what went into building this "chief sanctuary of the Virgin in Western Europe," how the cathedral fit into and changed the world around it, Gothic design and construction, and the literature connected to Chartres as well as to the urban centers of northern France in the twelfth and thirteenth centuries. Topics include: the pre-history of the present cathedral; royal, noble, and local patronage; sculptural programs of the west façade and northern and southern portals; stained glass programs of the west wall, nave, transept (great rose windows), and choir; relics; liturgical and affective experiences of Chartres; the cathedral as a physical, sacred and social space; the cult of the Virgin; new learning and the cathedral school; literary works attached to the Charlemagne window (*The Song of Roland*, *The Pilgrimage of Charlemagne*, *The Pseudo-Turpin*), to the cathedral more generally (*The Miracles of Our Lady of Chartres*), to the towns of medieval France (Fabliaux); renovation and restoration of post-medieval Chartres. HU

* **HUMS 427b / ENGL 456b / LITR 348b, The Practice of Literary Translation** Peter Cole

Intensive readings in the history and theory of translation paired with practice in translating. Case studies from ancient languages (the Bible, Greek and Latin classics), medieval languages (classical Arabic literature), and modern languages (poetic texts). HU

* **HUMS 443a / HIST 232Ja / JDST 270a / MMES 342a / RLST 201a, Medieval Jews, Christians, and Muslims In Conversation** Ivan Marcus

How members of Jewish, Christian, and Muslim communities thought of and interacted with members of the other two cultures during the Middle Ages. Cultural grids and expectations each imposed on the other; the rhetoric of otherness – humans or devils, purity or impurity, and animal imagery; and models of religious community and power in dealing with the other when confronted with cultural differences. Counts toward either European or Middle Eastern distributional credit within the History major, upon application to the director of undergraduate studies. WR, HU RP

* **HUMS 444a, The City of Rome** Virginia Jewiss

An interdisciplinary study of Rome from its legendary origins through its evolving presence at the crossroads of Europe and the world. Exploration of the city's rich interweaving of history, theology, literature, philosophy, and the arts in significant moments of Roman and world history. HU

* **HUMS 454a / ENGL 308a / FILM 242a / LITR 398a, Interpreting Film Masterpieces**

David Bromwich and Dudley Andrew

Exploration of seven auteurs from Europe and Hollywood, 1937–1967. Assessment of methods that deepen appreciation of the films and the medium. WR, HU

* **HUMS 456b / AFAM 182b / ENGL 182b, James Baldwin's American Scene**

Jacqueline Goldsby

In-depth examination of James Baldwin's canon, tracking his work as an American artist, citizen, and witness to United States society, politics, and culture during the Civil Rights and Black Arts Movements. WR, HU

The Franke Seminars

The Shulman Seminar

* **HUMS 463b / RLST 117 / RLST 437, Critical Theories of Science and Religion**

Joanna Radin and Noreen Khawaja

This course is an introduction to new thinking about the relationship of science and religion in global modernities. Drawing from work in feminist and indigenous studies, critical race theory, postcolonial studies, and multispecies thought, we explore systematic questions at the intersection of metaphysics, history of science, and politics. How can attending to the role of practice alter our understanding of how knowledge is produced across scientific and religious worlds? What is a world, and who gets to define it? How might a new contract between science and religion reveal fresh possibilities for an ethical response to late capitalism: addressing historic exclusions, structural inequalities, and human-nonhuman relations? Readings may include: Bruno Latour, Donna Haraway, Kim TallBear, Anna Tsing, Isabell Stengers, Cathy Gere, Mary-Jane Rubenstein, Karen Barad, Robert Bellah, Gabriel Marcel, Elizabeth Povinelli, Nadia Abu El-Haj, Aicha Beliso-De Jesus, Marilyn Strathern, Catherine Keller, Abou Farman, Webb Keane. HU

Individual Research and Senior Essay Courses

* **HUMS 470a and HUMS 471b, Special Studies in the Humanities** Norma

Thompson

For students who wish to pursue a topic in Humanities not otherwise covered. May be used for research or for directed reading under the guidance of one or more faculty advisers. In either case a term paper or its equivalent is required, as are regular meetings with the adviser or advisers. To apply, a student should present a prospectus and a bibliography signed by the adviser or advisers to the director of undergraduate studies. Enrollment limited to juniors and seniors majoring in Humanities.

* **HUMS 471b, Special Studies in the Humanities** Norma Thompson

For students who wish to pursue a topic in Humanities not otherwise covered. May be used for research or for directed reading under the guidance of one or more faculty advisers. In either case a term paper or its equivalent is required, as are regular meetings with the adviser or advisers. To apply, a student should present a prospectus and a bibliography signed by the adviser or advisers to the director of undergraduate studies. Enrollment limited to juniors and seniors majoring in Humanities.

* **HUMS 491a or b, The Senior Essay** Norma Thompson

Independent library-based research under faculty supervision. To register, students must consult the director of undergraduate studies no later than the end of registration period in the previous term. A written plan of study approved by a faculty adviser must be submitted to the director of undergraduate studies by November 16, 2018, if the essay is to be submitted during the spring term, by May 1, 2019, for yearlong or fall-

term essays. A rough draft of the essay is due at noon on March 25, 2019 for spring-term essays or on October 29, 2018 for fall-term essays. The final essay is due at noon on April 8, 2019 for spring-term essays or on December 3, 2018 for fall-term essays; late essays will be penalized by a lower grade. RP

Italian

Director of undergraduate studies: Christiana Purdy Moudarres
(christiana.purdymoudarres@yale.edu), 82–90 Wall St., 432-0597; language program
director: Anna Iacovella (anna.iacovella@yale.edu), 82–90 Wall St., 432-8299;
italian.yale.edu

The major in Italian explores Italy's vital role in the formation of Western thought and culture. The core language courses bring students to a high level of aural, spoken, and written proficiency; provide a solid literary and historical background in the language; and prepare students for study in Italy. Other offerings build on the core courses to explore Italian literature, film, history, culture, and art. The Italian major is of particular relevance to the fields of art, economics, film and media studies, history, history of art, international relations, linguistics, literature, philosophy, and theology.

PREREQUISITE

Candidates for the major should have completed a course in Italian at the level of ITAL 130 (L3) or should have received credit for equivalent work by the end of their sophomore year. Exceptions may be made in the case of outstanding students who have not satisfied this requirement.

PLACEMENT PROCEDURES

All students who have not taken Italian at Yale are expected to take the departmental placement test, with the exception of students who have no previous knowledge of Italian. The placement examination is completed online during the summer; see the *Calendar for the Opening Days of College* and the department website for details.

REQUIREMENTS OF THE MAJOR

The major normally consists of eleven term courses beyond the prerequisite. Eight term courses in the Italian department numbered 140 or above (including graduate courses) are required, at least five of which must be conducted in Italian. The courses in the department must include either ITAL 150 or 151 and a course on Dante's *Divine Comedy* (ITAL 310 or equivalent), as well as four courses covering different periods in Italian literature: one in the Middle Ages (in addition to the course on Dante's *Divine Comedy*), one in the Renaissance, and two in Italian literature after 1600. The aim of these six foundation courses is to provide students with both a broad acquaintance with the major works of Italy's literary tradition and a more detailed knowledge of specific periods in Italian literature. Students are also strongly encouraged to use their elective courses to expand their knowledge of either the *Trecento* (fourteenth century) or the *Cinquecento* (sixteenth century). No more than three Italian department courses taught in English may count toward the major. Students intending to major in Italian should consult the DUS.

In completing their programs, students are required to elect two courses in other languages and literatures, history of art, history, or philosophy that are related to their field of study and approved by the director of undergraduate studies (DUS). Any graduate course in another national literature or in linguistics may be substituted for one of these two courses. Some knowledge of Latin is desirable.

SENIOR REQUIREMENT

In the fall or spring of the senior year, all students majoring in Italian must present a departmental essay written in Italian and completed under the direction of a faculty adviser in ITAL 491. The essay should demonstrate careful reading and research on a topic approved by the adviser in consultation with the DUS. A recommended length for the essay is thirty pages. Prospectus and draft deadlines are determined by the adviser; the final deadline is determined by the DUS. The senior requirement culminates in a meeting with department faculty to discuss the thesis and the student's overall experience of study in the major.

ADVISING

The department's course offerings vary greatly from year to year. Students interested in planning course work in Italian that extends beyond the current academic year should consult the DUS.

Related majors In addition to the major in Italian literature, the department supports the applications of qualified students who wish to pursue a course in Italian studies under the provisions of a Special Divisional Major. Majors can devise a broad program in social, political, economic, or intellectual history as related to and reflected in Italian literature, or pursue special interests in architecture, film, art, philosophy, music, history, linguistics, theater, political theory, or other fields especially well suited for examination from the perspective of Italian cultural history. Majors in Italian studies must design their programs in close consultation with the DUS and seek the guidance of an additional member of the department whose interests closely coincide with the proposed program of study. For further information, see Special Divisional Majors.

Combined B.A./M.A. degree program Exceptionally able and well-prepared students may complete a course of study leading to the simultaneous award of the B.A. and M.A. degrees after eight terms of enrollment. See Academic Regulations, section K, Special Arrangements, "Simultaneous Award of the Bachelor's and Master's Degrees." Interested students should consult the DUS prior to the sixth term of enrollment for specific requirements in Italian.

STUDY ABROAD

For information about the Year or Term Abroad program, see Academic Regulations, section K, Special Arrangements, "Year or Term Abroad."

REQUIREMENTS OF THE MAJOR

Prerequisite ITAL 130 or equivalent

Number of courses 11 term courses beyond prereq (incl senior req)

Specific courses required ITAL 150 or 151; ITAL 310 or equivalent

Distribution of courses 8 term courses in Italian dept numbered 140 or above, incl 1 in Middle Ages (in addition to ITAL 310), 1 in Renaissance, and 2 in Italian lit after 1600, at least 5 of these conducted in Italian; 2 courses in other langs or lits, hist of art, hist, or phil approved by DUS

Substitution permitted Any grad course in another national lit or in linguistics for 1 of the 2 courses in other depts, with DUS permission

Senior requirement Senior essay (ITAL 491) and oral interview

CERTIFICATE OF ADVANCED LANGUAGE STUDY

The Italian Department offers a Certificate of Advanced Language Study in Italian. A certificate adviser, typically the director of undergraduate studies (DUS), advises students on the certification process and certifies to the University Registrar's Office that students have completed the stated requirements before the end of eight terms of study. The Certificate of Advanced Language Study, once certified, is listed on student transcripts.

REQUIREMENTS

Students seeking to earn the certificate are required to take four courses beyond the L4 level in their chosen language, at least two of which must be Yale courses designated as L5. All courses must be taken for a letter grade, and students must achieve a grade of B or above. With the approval of the certificate adviser, one advanced non-L5 course, conducted in the target language, such as an independent study course, a graduate seminar, or an advanced seminar may count toward certification requirements.

The certificate adviser may allow one “language across the curriculum” (LxC) course, which ordinarily is an advanced seminar with an additional weekly discussion section in the target language, to count toward the certification requirements. The adviser may also approve the substitution of up to two credits earned during study abroad and taught in the target language to count toward the certificate requirements. If the adviser approves courses taken outside of Yale for inclusion in the certificate requirements, students must take the necessary steps to ensure those courses appear on their transcript.

Credit/D/Fail No courses taken Credit/D/Fail may be counted toward the requirements of the certificate.

FACULTY OF THE DEPARTMENT OF ITALIAN

Professors Millicent Marcus, Giuseppe Mazzotta, Jane Tylus (*Chair*)

Assistant Professor Christiana Purdy Moudarres

Senior Lectors Michael Farina, Anna Iacovella

Lector Simona Lorenzini

Postdoctoral Associate Serena Bassi

Affiliated Faculty Paola Bertucci, (*History of Science, Medicine, and Public Health*), Howard Bloch (*French*), Jessica Brantley (*English*), Roberto González Echevarría (*Spanish & Portuguese*), Harvey Goldblatt (*Slavic*), Virginia Jewiss (*Humanities*), Jacqueline Jung (*History of Art*), Gundula Kreuzer (*Music*), Ivan Marcus (*History and Religious Studies*), David Quint (*English and Comparative Literature*), Ayesha Ramachandran (*Comparative Literature*), Ellen Rosand (*Music*), Pierre Saint-Amand (*French*), Gary Tomlinson (*Music*)

Group A Courses

* **ITAL 110a, Elementary Italian I** Staff

A beginning course with extensive practice in speaking, reading, writing, and listening and a thorough introduction to Italian grammar. Activities include group and pairs

work, role-playing, and conversation. Introduction to Italian culture through readings and films. Conducted in Italian. L1 1½ Course cr

*** ITAL 130a, Intermediate Italian I** Staff

The first half of a two-term sequence designed to increase students' proficiency in the four language skills and advanced grammar concepts. Authentic readings paired with contemporary films. In-class group and pairs activities, role-playing, and conversation. Admits to ITAL 140. Conducted in Italian. ITAL 120 or equivalent. L3 1½ Course cr

Group B Courses

Group B courses have readings in Italian and are usually conducted in Italian. They are open to students who have passed ITAL 140 or 145 and to others with the consent of the director of undergraduate studies and the instructor.

ITAL 150a, Advanced Composition and Conversation Julia Pucci

Discussion of social, political, and literary issues in order to improve active command of the language. Development of advanced reading skills through magazine and newspaper articles, essays, short stories, films, and a novel; enhancement of writing skills through experiments with reviews, essays, creative writing, and business and informal Italian. Classroom emphasis on advanced speaking skills and vocabulary building. L5

*** ITAL 162a, Introduction to Italian Literature: From the Duecento to the Renaissance** Simona Lorenzini

This is the first course in a sequence studying Italian Literature. The course aims to provide an introduction and a broad overview of Italian literature and culture from the Duecento to the Renaissance, specifically focusing on authors such as Dante, Petrarch, Boccaccio, Machiavelli, Ariosto, and literary and artistic movements such as Humanism and Renaissance. These authors and their masterpieces are introduced through readings, works of art, listening materials, videos, and films. Great space is left for in-class discussion and suggestions from students who may take an interest in specific authors or subjects. This course is interactive and open, and the authors mentioned here are only indicative of the path that we follow. At the end of the course, students are able to analyze and critique literary works of different genres and time periods. The course is conducted in Italian. Prerequisite: ITAL 140 or equivalent. L5, HU

*** ITAL 172b, Introduction to Italian Literature: From the Baroque to the Present**
Simona Lorenzini

This course is the second course in a sequence studying Italian Literature. This course introduces students to the masterpieces of Italian literature, in prose and poetry, from the Baroque to the 21st century. We closely read sample writings representative of the most important authors and literary movements, including Galileo, Manzoni, Pirandello, and Ferrante, and the ways in which they encompassed science, medicine, culture, law, gender. Through critical readings, textual analysis, and class discussions, students appreciate the intellectual and artistic traditions that shaped the birth of the Italian nation. Texts and authors are examined in their historical, social, and cultural context. The course is conducted in Italian. Students are required to take notes during the lectures and learn new vocabulary specific to the topic studied. Prerequisite: ITAL 140 or equivalent. L5, HU

* **ITAL 185a, Italian History from 1945** Serena Bassi

An examination of the major events in Italian history from 1945 to the present. Advanced grammar, writing, and speaking explored in the context of Italian history. Topics include World War II, the founding of the Italian Republic, postwar reconstruction, the major political parties, the protest movements of 1968, the collapse of the Left, and the rise of the Northern League and Berlusconi. Consideration also given to immigration, the environment, and cultural issues. L5, HU

* **ITAL 309a / ENGL 219a / HUMS 149a / LITR 179a / WGSS 179a, Gender and Genre in Renaissance Love Poetry** Ayesha Ramachandran

Introduction to the poetic genres of lyric, epic, and pastoral in the European Renaissance. Focus on questions of desire, love, and gendered subjectivity. The historical contexts and political uses of discourses of eroticism and pleasure in Italy, Spain, France, and England. Written exercises include poetic imitations of Renaissance texts. HU

* **ITAL 470a and ITAL 471a, Special Studies in Italian Literature** Christiana Purdy Moudarres

A series of tutorials to direct students in special interests and requirements. Students meet regularly with a faculty member.

* **ITAL 491a, The Senior Essay** Christiana Purdy Moudarres

A research essay on a subject selected by the student in consultation with the faculty adviser.

Group C Courses

Group C courses are conducted in English and are open to students without previous study of Italian. Majors in Italian are required to read the material and write their papers in Italian.

ITAL 310a / HUMS 180a / LITR 183a, Dante in Translation Christiana Purdy Moudarres

A critical reading of Dante's *Divine Comedy* and selections from the minor works, with an attempt to place Dante's work in the intellectual and social context of the late Middle Ages by relating literature to philosophical, theological, and political concerns. No knowledge of Italian required. Course conducted in English. HU TR

ITAL 315a / HIST 280a / RLST 160a, The Catholic Intellectual Tradition Carlos Eire
Introductory survey of the interaction between Catholicism and Western culture from the first century to the present, with a focus on pivotal moments and crucial developments that defined both traditions. Key beliefs, rites, and customs of the Roman Catholic Church, and the ways in which they have found expression; interaction between Catholics and the institution of the Church; Catholicism in its cultural and sociopolitical matrices. Close reading of primary sources. HU

* **ITAL 367a / LITR 327a, Saying Goodbye: Meditations on Art, Death and Afterlives, the Bible through Shakespeare and Sor Juan** Jane Tylus

How do we take leave of the people, places, and work that we love? Our course objectives are to strive to understand the important role that leavetakings play in life and artistic expression, especially between 1300–1700; to probe the differences between religious faiths of early modernity with respect to rituals of saying goodbye and the afterlife; to sharpen our skills as readers, spectators, and listeners of works that engage

with complex questions regarding the meaning of life and one's lifework; and to contextualize our readings within more contemporary conversations by theologians and theorists about dying, grief, and letting go. We also examines rites of passage and departure, even as our main focus is figures such as Dante, Michelangelo, Montaigne, Shakespeare, and Sor Juana Inés de la Cruz, whose differing faiths during a period of religious crisis produced various kinds of finished – and unfinished – works. Our class is held in the Beinecke library, where we regularly consult first editions and in some cases (Donne's letters and poems) autograph copies, as well as evaluate the material evidence for ways that manuscripts and books reveal how authors parted with their works (dedications, envois), and how readers comment on their own encounters with leavetakings. WR, HU

Judaic Studies

Director of undergraduate studies: David Sorkin (david.sorkin@yale.edu), 212 McClellan Hall; judaicstudies.yale.edu

Judaic Studies enables students to develop a broad knowledge of the history, religion, literature, philosophy, languages, and politics of the Jews. Jewish society, texts, ideologies, material cultures, and institutions are studied from a comparative perspective in the context of histories, cultures, and intellectual traditions among which Jews have lived throughout the ages. As an interdisciplinary program, Judaic Studies employs historical, literary, political, social, and philosophical methods of analysis.

The Judaic Studies major—especially as a second major with Economics, Political Science, Literature, English, Philosophy, or History—offers a broad liberal arts background combined with intensive preparation in the historical and religious experience of Jewish culture from antiquity to contemporary times. The major epochs of Jewish history are the Persian and Hellenistic, classical, medieval, early modern, and modern periods.

Students considering the major in Judaic Studies should contact the director of undergraduate studies (DUS) as early as possible.

REQUIREMENTS OF THE MAJOR

The major in Judaic Studies requires thirteen term courses, including three courses selected from a set of core requirements, a language or literature requirement, three courses selected from each of two areas of concentration, and the senior requirement.

Core requirements Each student must elect at least three from the following: (1) a course in Hebrew Bible, such as JDST 110; (2) a course in rabbinic literature or ancient Judaism, such as JDST 235; (3) JDST 200; (4) JDST 201; (5) a course in Jewish thought, such as JDST 281 or JDST 293; (6) a survey course in Hebrew and Jewish literature.

Language or literature requirements Students must complete either HEBR 110 and 120 or two courses in Hebrew literature in translation. Up to three Hebrew language courses may be counted toward the requirements of the major.

Areas of concentration Students must select two of the following areas of concentration: ancient Israel/Hebrew Bible; Judaism and Jewish history of Second Temple and Talmudic times; Jewish history and civilization of medieval and Renaissance times; modern Jewish history and civilization; Jewish/Hebrew literature (which requires the study of literature in Hebrew); and Jewish thought. With the approval of the DUS, students may design their own areas of concentration.

In each of the two areas of concentration, students choose three courses in consultation with the DUS. These are expected to comprise one introductory course; one seminar taken in the junior year, and one course requiring a final research paper. One relevant course should be in an area outside Judaic Studies, such as a course relating to the larger historical, literary, or philosophical context if the concentration is in a historical period, or a course in the theory or practice of literature if the concentration is in Jewish/Hebrew literature.

SENIOR REQUIREMENT

Students are required either to complete a two-term senior essay in JDST 491 and 492 related to both areas of concentration, or to complete a one-term senior essay in JDST 491 or 492 related to one area of concentration and an additional seminar related to the other. The senior essay may build on research conducted for one or both of the student's junior seminar papers.

STUDY ABROAD

Students majoring in Judaic Studies should be aware of the numerous opportunities for study abroad. Those interested in research and language-study opportunities in the Middle East, Europe, and South America should consult the DUS.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 13 term courses (incl senior req)

Distribution of courses 3 courses from (1) Hebrew Bible, (2) rabbinic lit or ancient Judaism, (3) JDST 200, (4) JDST 201, (5) Jewish thought, (6) survey of Hebrew and Jewish lit; HEBR 110 and 120, or 2 courses in Hebrew lit in translation; 2 areas of concentration, with 3 courses in each for a total of 6

Senior requirement Two-term senior essay (JDST 491, 492) or one-term senior essay (JDST 491 or 492), and additional seminar

FACULTY ASSOCIATED WITH THE PROGRAM OF JUDAIC STUDIES

Professors Joel Baden (*Divinity School*), Leslie Brisman (*English*), Steven Fraade (*Chair*) (*Religious Studies*), Paul Franks (*Philosophy*), Warren Zev Harvey (*Philosophy*) (*Visiting*), Christine Hayes (*Religious Studies*), Hannan Hever (*Literature*), Ivan Marcus (*History, Religious Studies*), Steven Smith (*Political Science, Philosophy*), David Sorkin (*History*), Laura Wexler (*Women's, Gender, & Sexuality Studies, American Studies*), Robert Wilson (*Religious Studies*)

Associate Professors Joseph David (*Law*) (*Visiting*), Marci Shore (*History*), Eliyahu Stern (*Religious Studies, History*)

Senior Lecturer Peter Cole (*Comparative Literature*)

Lecturers Asaf Angermann (*Philosophy*), Yair Assulin (*Comparative Literature*) (*Visiting*), Alessia Bellusci (*History*), Allyson Gonzalez (*Religious Studies*), Margaret Olin (*Divinity School, History of Art, Religious Studies*), Micha Perry (*Visiting*)

Senior Lector II Shiri Goren

Senior Lectors Josh Price, Dina Roginsky, Orit Yeret

Special Project and Senior Essay Courses

* JDST 491a and JDST 492b, **The Senior Essay** David Sorkin

The essay, written under the supervision of a faculty member, should be a substantial paper between 6,500 and 8,000 words for one term and between 12,500 and 15,000 words for two terms.

Electives within the Major

BIBLICAL PERIOD

[JDST 110, *The Bible*]

CLASSICAL PERIOD

* JDST 256a / MMES 236a / NELC 232a / RLST 400a, *The Dead Sea Scrolls: The Damascus Document* Steven Fraade

Study of the Damascus Document, one of the most important of the Dead Sea Scrolls. Attention to the document's place in the history of biblical interpretation and ancient Jewish law; the nature and rhetorical function of its textual practices, both narrative and legal; and its relation to the central sectarian writings of the Qumran community. Prerequisite: reading proficiency in ancient Hebrew. L5, HU

JEWISH PHILOSOPHY

* JDST 223a / HUMS 295a / PLSC 307a, *Trials of Uncertainty* Norma Thompson
Is the demise of the trial at hand? The trial as cultural achievement, considered as the *epitome* of humanistic inquiry, where all is brought to bear on a crucial matter in an uncertain context. Truth may be hammered out or remain elusive, but the expectation in the court case has been that the adversarial mode works best for sorting out evidentiary conundrums. Inquiries into issues of meaning of the trial, its impartiality, and challenges to its durability. The role of character, doubt, and diagnosis explored in Sophocles, Plato, Cicero, Burke, Jane Austen, Tocqueville, and Kafka, as well as in twentieth-century trials, films, documentaries, and twenty-first-century medical narratives. WR, HU

MEDIEVAL AND EARLY MODERN PERIODS

JDST 265b / HIST 345b / MMES 148b / RLST 202b, *Jews in Muslim Lands from the Seventh to the Sixteenth Centuries* Staff

Jewish culture and society in Muslim lands from the time of the Prophet Muhammad to that of Suleiman the Magnificent. Topics include Islam and Judaism; Jerusalem as a holy site; rabbinic leadership and literature in Baghdad; Jewish courtiers, poets, and philosophers in Muslim Spain; and the Jews in the Ottoman Empire. HU RP

* JDST 270a / HIST 232Ja / HUMS 443a / MMES 342a / RLST 201a, *Medieval Jews, Christians, and Muslims In Conversation* Ivan Marcus

How members of Jewish, Christian, and Muslim communities thought of and interacted with members of the other two cultures during the Middle Ages. Cultural grids and expectations each imposed on the other; the rhetoric of otherness—humans or devils, purity or impurity, and animal imagery; and models of religious community and power in dealing with the other when confronted with cultural differences. Counts toward either European or Middle Eastern distributional credit within the History major, upon application to the director of undergraduate studies. WR, HU RP

* JDST 374a / HIST 249Ja, *Jewish Magic* Alessia Bellusi

The course explores the history of Jewish magic from the Bible to our time, focusing on the development and transmission of magical lore in the late antique and medieval Jewish world. We introduce the most important methodological approaches developed to study magical traditions in the context of Religious Studies, discussing topics such as the impact of magic on pre-modern cultures, the interculturality of magic, the

relation magic-religion-science, magic and gender, the efficacy of the magical/ritual act. Through the analysis of magical artifacts and manuscript excerpts, we familiarize with Jewish magical literature and specific magical behaviors, with attention to analogous phenomena developed among Near-Eastern and Mediterranean civilizations. HU

MODERN PERIOD

* **JDST 319a / HEBR 162a / MMES 161a, Israel in Ideology and Practice** Dina Roginsky

An advanced Hebrew class focusing on changing ideology and politics in Israel. Topics include right and left wing political discourse, elections, State-Religion dynamics, the Jewish-Arab divide, and demographic changes. Materials include newspapers, publications, on-line resources, speeches of different political and religious groups, and contemporary and archival footage. Comparisons to American political and ideological discourse. Prerequisite: HEBR 140 or permission of instructor. L5 RP

JDST 346a / HIST 249a, Making European Culture Jewish: Five Media, 1780-1930
David Sorkin

This course studies the ways in which Jewish writers and artists turned European culture into Jewish culture, that is, how a minority group fashioned its own version of the majority culture. As European Jews encountered European culture and society, they had to grapple with a host of fundamental questions. What was Judaism and who were the Jews: a religion, a history, a culture, a nation? We examine the way in which writers and artists struggled with these issues in five media: memoir, theology, history, fiction, and painting, thereby creating Jewish versions first of Enlightenment, Romanticism, and realism (1780-1870) and then of nationalism, positivism, and modernism (1870-1930). HU

Language and Literature

* **JDST 213a / HEBR 150a / MMES 150a, Advanced Modern Hebrew: Daily Life in Israel** Orit Yeret

An examination of major controversies in Israeli society. Readings include newspaper editorials and academic articles as well as documentary and historical material. Advanced grammatical structures are introduced and practiced. Conducted in Hebrew. Prerequisite: HEBR 140 or equivalent. L5 RP

* **JDST 305b / HEBR 158b / MMES 168b, Contemporary Israeli Society in Film** Shiri Goren

Examination of major themes in Israeli society through film, with emphasis on language study. Topics include migration, gender and sexuality, Jewish/Israeli identity, and private and collective memory. Readings in Hebrew and English provide a sociohistorical background and bases for class discussion. HEBR 140 or permission of instructor. L5, HU RP

* **JDST 326a / LITR 317a, Marxist Theory of Literature** Hannan Hever

The role of Marxist thought in understanding literary institutions and texts in the twentieth century. Marx's theory of ideology; Lukacs's theory of literature as the basis for development of Marxist literary theory; the Frankfurt and materialistic schools. Readings include works by Raymond Williams, Catherine Belsey, Walter Benjamin, Pierre Macherey, and Frederic Jameson. HU

*** JDST 327b / ER&M 416b / GMAN 411b / HUMS 342b / LITR 406b, World Literature** Hannan Hever

The concept of world literature, from its origins in eighteenth-century cosmopolitanism represented by Herder and Goethe up to contemporary critical debates (Apter, Casanova, Cheah, Damrosch, Dharwadker, I. Hesse, Moretti, Mufti, Pollock, Said, Spivak). World literature in relation to national literature, German-language, and Jewish literature; translation, untranslatability, the effect of markets, diaspora, politics. Literary critical readings supplemented by exemplary literary texts in multiple genres. Student contributions based on individual linguistic backgrounds. HU

*** JDST 356b / LITR 342b, Jewish Literary Masterpieces** Hannan Hever

Exploration of the nature of Jewish identity through a literary prism, focusing on novels, stories, poetry, and homilies. Study of texts written over a three thousand year period by Jews living in the Middle East, Europe, and America, from biblical writings through modern works composed by Franz Kafka, Philip Roth, as well as Israeli Literature. Special attention given to the role of gender, minority identities, and the idea of nationalism. Taught in translation, readings in English. HU RP

*** JDST 391a / NELC 381a / RLST 407a, Midrash Seminar: Sifre Shofetim** Steven Fraade

Close study of the earliest rabbinic commentary to the Book of Deuteronomy, focusing on its interpretations of laws dealing with the responsibilities of courts and public figures: judges, kings, priests, and prophets. Particular attention is paid to the interrelation of rabbinic legal rhetoric and the hermeneutics of scriptural commentary, with comparisons to other corpora of ancient Jewish and non-Jewish laws. Prerequisite: reading fluency in ancient Hebrew. L5, HU

*** JDST 402a / HEBR 167a / MMES 166a, Creative Writing in Hebrew** Orit Yeret

An advanced language course with focus on creative writing and self-expression. Students develop knowledge of modern Hebrew, while elevating writing skills based on special interests, and in various genres, including short prose, poetry, dramatic writing, and journalism. Students engage with diverse authentic materials, with emphasis on Israeli literature, culture, and society. Prerequisite: HEBR 140 or placement exam. L5 RP

*** JDST 403b / HEBR 169b / MMES 162b, Languages in Dialogue: Hebrew and Arabic** Dina Roginsky

Hebrew and Arabic are closely related as sister Semitic languages. They have a great degree of grammatical, morphological, and lexical similarity. Historically, Hebrew and Arabic have been in cultural contact, especially in medieval Spain, the Middle East, and North Africa—as evidenced by the Judeo-Arabic languages. In modern Israel, Arabic is the native tongue of about 20% of its population, yet lack of communication exists today between Hebrew speakers and Arabic speakers for mainly political reasons. This L5 advanced Hebrew class explores cultural and linguistic contacts between the two languages and relationships between the communities, including both Jewish and non-Jewish Arabic speakers and Hebrew speakers. Additionally, students benefit from regular meetings with a parallel L5 Arabic class which discusses similar topics. The shared meetings enable Hebrew learners and Arabic learners to participate together in one class, to promote social interaction based on mutual respect and to focus on cultural

and linguistic aspects of the material. L4 Hebrew or equivalent (placement test). L5
RP

* **JDST 416a / GMAN 102a, Reading Yiddish** Joshua Price

This course is designed to build literacy in Yiddish, the vernacular of Ashkenazi Jewry. With focus on the accelerated treatment of Yiddish grammar, regularly supplemented with simple primary texts (poems, songs, folktales), and followed by close readings of (modern) Yiddish literature, students will be able to navigate most Yiddish texts with the aid of a dictionary. May not be taken concurrently with elementary or intermediate German.

* **JDST 417b / HEBR 164b / MMES 167b, Biblical to Modern Hebrew for Reading Knowledge** Dina Roginsky

Instruction in the linguistic needs of students who have reading knowledge of Biblical Hebrew but cannot read or converse in Modern Hebrew. Concentration on reading comprehension of Modern Hebrew for research purposes, particularly scholarly texts tailored to students' areas of interest. Two years of Biblical or Modern Hebrew studies, or permission of the instructor. RP

* **JDST 418b / GMAN 103b, Reading Yiddish II** Joshua Price

Intermediate study of Yiddish literary language with annotated readings from classic authors including: Mendele, Sholem Aleichem, Peretz, Bergelson, Der Nister, Bashevis, as well as American and Soviet Yiddish poetry. Secondary readings in English will offer a broader introduction to the modern Yiddish canon. Continuation of GMAN 102/ JDST 416. Previous knowledge of German or Hebrew-Aramaic recommended but not required.

Latin American Studies

Director of undergraduate studies: Ana De La O (ana.delao@yale.edu), C120, 77 Prospect St., 432-5234; macmillan.yale.edu/academic-programs

The major in Latin American Studies is designed to further understanding of the societies and cultures of Latin America as viewed from regional and global perspectives. The Latin American Studies major builds on a foundation of language and literature, history, history of art, theater studies, humanities, and the social sciences; its faculty is drawn from many departments and professional schools of the University.

The major in Latin American Studies is interdisciplinary. With two goals in mind—intellectual coherence and individual growth—the student proposes a course of study that must satisfy the requirements listed below. The proposed course of study must be approved by the director of undergraduate studies (DUS). Though all students choose courses in both the humanities and the social sciences, they are expected to concentrate on one or the other.

PREREQUISITES

Prerequisite to the major is knowledge of the two dominant languages of the region, Spanish and Portuguese. Depending on their interests, students select one language for two years of instruction and the other for one. Other languages necessary for research may in appropriate circumstances be substituted for the second language with the consent of the DUS. Students are encouraged to meet the language requirements as early as possible. Courses used to satisfy the language prerequisite may not be counted toward the major.

REQUIREMENTS OF THE MAJOR

The major itself requires twelve term courses: one introductory course approved by the DUS; eight courses related to Latin America from departmental offerings or from a provided list of electives; two additional electives; and the senior essay, LAST 491. The eight Latin American content courses should include courses from the following categories: two courses in the social sciences (anthropology, economics, or political science); two courses in history; two courses in Spanish American or Brazilian literatures beyond the language requirement; one course in art, architecture, film and media studies, music, or theater studies; and one seminar in any area related to Latin American Studies. Students wishing to count toward the major courses that do not appear in the program's course offerings should consult with the DUS.

Students must enroll in three seminars or upper-level courses during their junior and senior years. Elective seminars must be approved by the DUS, who can provide a list of appropriate courses.

SENIOR REQUIREMENT

The senior essay is a research paper written usually in one term in LAST 491. Students choose their own topics, which may derive from research done in an earlier course. The essay is planned in advance in consultation with a qualified adviser and a second reader.

In preparing the senior essay, Latin American Studies majors may undertake field research in Latin America. Students are encouraged to apply for summer travel grants through the Council on Latin American and Iberian Studies to conduct field research

for their senior thesis. The Albert Bildner Travel Prize is awarded to an outstanding junior who submits an application in Spanish or Portuguese in addition to the English application essay. Information about these and other grants is available on Yale's Student Grants & Fellowships website.

ADVISING

A list of courses intended as a guide to students in preparing their programs is available at the office of the DUS and on the Council on Latin American and Iberian Studies website. Qualified students may also elect pertinent courses in the Graduate School and in some of the professional schools with permission of the director of graduate studies or professional school registrar and the DUS.

STUDY ABROAD

Students are strongly encouraged to take advantage of study abroad opportunities during summers or through the Year or Term Abroad program.

REQUIREMENTS OF THE MAJOR

Prerequisites 2 years of 1 lang (Spanish or Portuguese), 1 year of the other

Number of courses 12 courses beyond prereqs (incl senior essay)

Distribution of courses 1 intro course approved by DUS; 8 courses related to Latin America in specified fields; 2 electives; 3 sems or upper-level courses in junior and senior years, approved by DUS

Senior requirement Senior essay (LAST 491)

FACULTY ASSOCIATED WITH THE PROGRAM OF LATIN AMERICAN STUDIES

Professors Rolena Adorno (*Spanish & Portuguese*), Ned Blackhawk (*History, American Studies*), Richard Burger (*Anthropology*), Hazel Carby (*African American Studies, American Studies*), Carlos Eire (*History, Religious Studies*), Eduardo Fernandez-Duque (*Anthropology*), Paul Freedman (*History*), Aníbal González (*Spanish & Portuguese*), Roberto González Echevarría (*Spanish & Portuguese*), K. David Jackson (*Spanish & Portuguese*), Gilbert Joseph (*History*), Stathis Kalyvas (*Political Science*), Daniel Markovits (*Law School*), Mary Miller (*History of Art*), Stephen Pitti (*History*), Susan Rose-Ackerman (*Law School, Political Science*), Alicia Schmidt Camacho (*American Studies*), Stuart Schwartz (*History*), Susan Stokes (*Political Science*), Robert Thompson (*History of Art*), Noël Valis (*Spanish & Portuguese*), Frederick Wherry (*Sociology*), Elisabeth Wood (*Political Science*)

Associate Professors Robert Bailis (*Forestry & Environmental Studies*), Susan Byrne (*Spanish & Portuguese*), Rodrigo Canales (*School of Management*), Ana De La O (*Political Science*), Moira Fradinger (*Comparative Literature*)

Assistant Professors Vanessa Agard-Jones (*Women's, Gender, & Sexuality Studies*), Ryan Bennett (*Linguistics*), Oswaldo Chinchilla (*Anthropology*), Marcela Echeverri (*History*), Anne Eller (*History*), Leslie Harkema (*Spanish & Portuguese*), Seth Jacobowitz (*East Asian Languages & Literatures*), Erica James (*History of Art, African American Studies*), Albert Laguna (*American Studies, Ethnicity, Race, & Migration*), Dixá Ramirez (*American Studies, Ethnicity, Race, & Migration*)

Senior Lectors II Margherita Tortora, Sonia Valle

Senior Lectors Sybil Alexandrov, Marta Almeida, María Pilar Asensio-Manrique, Mercedes Carreras, Ame Cividanes, Sebastián Díaz, María de la Paz García, María Jordán, Rosamaría León, Juliana Ramos-Ruano, Lissette Reymundi, Lourdes Sabé-Colom, Bárbara Saffile, Terry Seymour

Lector Selma Vital

Electives within the Major

Students wishing to count toward the major courses that do not appear on this list should consult with the director of undergraduate studies.

AFST 333a / HIST 332a, African Encounters with Colonialism Daniel Magaziner
How African societies and peoples encountered, engaged, and endured the colonial and postcolonial world, from the arrival of Kiswahili-speaking traders at the shores of Lake Victoria in the 1840s through the rise and fall of European colonialism and the resulting forms of neocolonialism. Transformations and continuities in African religious life; gendered sociability; popular culture. HU

* **AMST 441a / ER&M 370a / HIST 130Ja, Indians and the Spanish Borderlands** Ned Blackhawk

The experiences of Native Americans during centuries of relations with North America's first imperial power, Spain. The history and long-term legacies of Spanish colonialism from Florida to California. WR, HU

ECON 325b / EP&E 321b / SAST 281b, Economics of Developing Countries: Focus on South Asia Zachary Barnett-Howell

Analysis of current problems of developing countries. Emphasis on the role of economic theory in informing public policies to achieve improvements in poverty and inequality, and on empirical analysis to understand markets and responses to poverty. Topics include microfinance, education, health, agriculture, intrahousehold allocations, gender, and corruption. Prerequisites: introductory microeconomics and introductory econometrics. SO

ER&M 200a, Introduction to Ethnicity, Race, and Migration Alicia Camacho

Historical roots of contemporary ethnic and racial formations and competing theories of ethnicity, race, and migration. Cultural constructions and social practices of race, ethnicity, and migration in the United States and around the world. HU, SO

* **ER&M 300a or b, Comparative Ethnic Studies** Staff

Introduction to the methods and practice of comparative ethnic studies. Examination of racial formation in the United States within a transnational framework. Legacies of colonialism, slavery, and racial exclusion; racial formation in schools, prisons, and citizenship law; cultural politics of music and performance; social movements; and postcolonial critique. SO

* **EVST 345a / ANTH 382a / ER&M 395a / F&ES 384a, Environmental Anthropology** Michael Dove

The history and contemporary study of anthropology and the environment, with special attention to current debates regarding human environmental relations. Topics include: nature-culture dichotomy; ecology and social organization; methodological debates; politics of the environment; and knowing the environment. SO

* **F&ES 020a / EVST 020a, Sustainable Development in Haiti** Gordon Geballe
The principles and practice of sustainable development explored in the context of Haiti's rich history and culture, as well as its current environmental and economic impoverishment. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR

* **FILM 363a / LITR 360a, Radical Cinemas of Latin America** Moira Fradinger
Introduction to Latin American cinema, with an emphasis on post-World War II films produced in Cuba, Argentina, Brazil, and Mexico. Examination of each film in its historical and aesthetic aspects, and in light of questions concerning national cinema and "third cinema." Examples from both pre-1945 and contemporary films. Conducted in English; knowledge of Spanish and Portuguese helpful but not required. HU

HIST 325b, Introduction to Latin American History Anne Eller
Critical themes and events in Latin American history from pre-Columbian times to the present. Major formative epochs such as the pre-Columbian era, colonization, independence, and contemporary moments; modern political flashpoints, including Haiti, Cuba, Argentina, and Peru. HU

HIST 465a / EVST 209a / HSHM 209a, Making Climate Knowledge Deborah Coen
This is a course about *how* humans have come to know what we know about our impacts on the earth's climate and our vulnerability to climate change. When did humans first *know* that their actions, in the aggregate, could transform the planet? Did scientists bear responsibility to warn of these consequences? In what ways has the modern science of climate both appropriated and undermined traditional and indigenous forms of climate knowledge? Students learn to work with the methods of history of science: we analyze science as a social and material process bound to the cultural and epistemological particularities of its historical context, and we examine the political dimensions of historical narratives about the emergence of the theory of global warming. Via hands-on experience with Yale's historical collections, students learn to analyze maps, artifacts, and instruments as historical sources. They also gain familiarity with the methods of environmental history, learning to attend to historical evidence of shifting relationships between humans and non-humans. Finally, students become more attuned to the evidence of climate change around them and more confident in their ability to make climate knowledge for themselves. WR, HU

* **HSHM 422a / HIST 467Ja, Cartography, Territory, and Identity** William Rankin
Exploration of how maps shape assumptions about territory, land, sovereignty, and identity. The relationship between scientific cartography and conquest, the geography of statecraft, religious cartographies, encounters between Western and non-Western cultures, and reactions to cartographic objectivity. Students make their own maps. No previous experience in cartography or graphic design required. WR, HU

LAST 214b / AFAM 186b / PLSC 378b / SOCY 170b, Contesting Injustice Elisabeth Wood
Exploration of why, when, and how people organize collectively to challenge political, social, and economic injustice. Cross-national comparison of the extent, causes, and consequences of inequality. Analysis of mobilizations for social justice in both U.S. and international settings. Intended primarily for freshmen and sophomores. SO

* **LAST 222a / SPAN 222a, Legal Spanish** Mercedes Carreras

An introduction to Spanish and Latin American legal culture with a focus on the specific traits of legal language and on the development of advanced language competence. Issues such as human rights, the death penalty, the jury, contracts, statutory instruments, and rulings by the constitutional courts are explored through law journal articles, newspapers, the media, and mock trials. Enrollment limited to 18. A maximum of one course in the 200–230 range may count as an elective toward the Spanish major. L5

* **LAST 223a or b / SPAN 223a or b, Spanish in Film: An Introduction to the New Latin American Cinema** Staff

Development of proficiency in Spanish through analysis of critically acclaimed Latin American films. Includes basic vocabulary of film criticism in Spanish as well as discussion and language exercises. Enrollment limited to 18. L5

* **LAST 225b / SPAN 225b, Spanish for the Medical Professions** Staff

Topics in health and welfare. Conversation, reading, and writing about medical issues for advanced Spanish-language students, including those considering careers in medical professions. Enrollment limited to 18. L5

* **LAST 227a / SPAN 227a, Creative Writing** María Jordán

An introduction to the craft and practice of creative writing (fiction, poetry, and essays). Focus on the development of writing skills and awareness of a variety of genres and techniques through reading of exemplary works and critical assessment of student work. Emphasis on the ability to write about abstract ideas, sentiments, dreams, and the imaginary world. Enrollment limited to 18. A maximum of one course in the 200–230 range may count as an elective toward the Spanish major. L5

* **LAST 243a or b / SPAN 243a or b, Advanced Spanish Grammar** Staff

A comprehensive, in-depth study of grammar intended to improve students' spoken and written command of Spanish. Linguistic analysis of literary selections; some English-to-Spanish translation. Enrollment limited to 18. L5

LAST 247a / SPAN 247a, Introduction to the Cultures of Latin America Rolena Adorno

A chronological study of Latin American cultures through their expressions in literature and the arts, beginning in the pre-Columbian period and focusing on the period from the nineteenth century to the present. Emphasis on crucial historical moments and on distinctive rituals such as fiestas. Open to students who have placed into L5 courses or who have successfully completed an L4 course in Spanish. Counts toward the major in Spanish. L5, HU

* **LAST 253a / HIST 253Ja, Dissidence and Control in Early Modern Spain and its Empire** María Jordán

Aspects of Spanish culture and society in the Golden Age (c. 1550–1650) that demonstrate discontent, dissidence, and suggestions for reform. Emphasis on the intersection of historical and literary sources and the dynamic between popular and elite cultures. WR, HU

LAST 261a / SPAN 261a, Studies in Spanish Literature I Staff

An introduction to Spanish prose, drama, and lyric poetry from their medieval multicultural origins through the Golden Age in the seventeenth century. Readings include *El Cid*, *La Celestina*, *Conde Lucanor*, and works by Miguel de Cervantes and

Calderón de la Barca. Open to students who have placed into L5 courses or who have successfully completed an L4 course in Spanish. Counts toward the major in Spanish.
L5, HU

* **LAST 262b / SPAN 262b, Studies in Spanish Literature II** Noël Valis

An introduction to Spanish prose, drama, and lyric poetry from the eighteenth century to the present, centered on the conflict between modernity and tradition and on the quest for national identity. Texts by Gustavo Adolfo Bécquer, Emilia Pardo Bazán, Antonio Machado, Federico García Lorca, Ramón Sender, and Ana María Matute, among others. Open to students who have placed into L5 courses or who have successfully completed an L4 course in Spanish. L5, HU

* **LAST 318b / ARCH 341b / GLBL 253b, Globalization Space** Keller Easterling

Infrastructure space as a primary medium of change in global polity. Networks of trade, energy, communication, transportation, spatial products, finance, management, and labor, as well as new strains of political opportunity that reside within their spatial disposition. Case studies include free zones and automated ports around the world, satellite urbanism in South Asia, high-speed rail in Japan and the Middle East, agripoles in southern Spain, fiber optic submarine cable in East Africa, spatial products of tourism in North Korea, and management platforms of the International Organization for Standardization. HU

* **LAST 351a / SPAN 350a, Borges: Literature and Power** Aníbal González Perez

An introduction to the work of Jorge Luis Borges, focusing on the relation between literature and power as portrayed in selected stories, essays, and poems. Topics include Borges and postmodernity; writing and ethics; and Borges's politics. Works include *Ficciones*, *Otras inquisiciones*, *El aleph*, *El hacedor*, *El informe de Brodie*, and *Obra poética*. Open to students who have placed into L5 courses or who have successfully completed an L4 course in Spanish. Counts toward the Spanish major. L5, HU

LAST 355a / HIST 355a, Colonial Latin America Stuart Schwartz

A survey of the conquest and colonization of Latin America from pre-Columbian civilizations through the movements for independence. Emphasis on social and economic themes and the formation of identities in the context of multiracial societies.
HU

* **LAST 372a / ER&M 342a / HIST 372Ja, Revolutionary Change and Cold War in Latin America** Gilbert Joseph

Analysis of revolutionary movements in Latin America against the backdrop of the Cold War. Critical examination of popular images and orthodox interpretations. An interdisciplinary study of the process of revolutionary change and cold war at the grassroots level. WR, HU

* **LAST 394a / LITR 294a / PORT 394a, World Cities and Narratives** K. David Jackson

Study of world cities and selected narratives that describe, belong to, or represent them. Topics range from the rise of the urban novel in European capitals to the postcolonial fictional worlds of major Portuguese, Brazilian, and Spanish American cities. Conducted in English. WR, HU TR

LAST 398a / AFAM 180a / LITR 329a / SPAN 398a, Caribbean Baseball: A Cultural History Roberto González Echevarría

A study of the origins and evolution of baseball in the Caribbean (Cuba, Dominican Republic, Puerto Rico) in the context of the region's political and cultural history and its relationship with the United States. The course begins with a consideration of the nature of games and the development and dissemination of sports by imperial powers since the nineteenth century: soccer, rugby, and tennis by the UK and basketball and baseball by the U.S. Topics to be considered: nationalism, the role of race, popular culture, the development of the media, the rise of stars and famous teams, the importance of the Negro Leagues, access of Caribbean players to the Major Leagues, the situation in the present. WR, HU

* **LAST 423a / EP&E 243a / GBLB 336a / PLSC 423a, Political Economy of Poverty Alleviation** Ana De La O

Overview of classic and contemporary approaches to the question of why some countries have done better than others at reducing poverty. Emphasis on the role of politics. SO

* **LITR 360a / FILM 363a, Radical Cinemas of Latin America** Moira Fradinger
Introduction to Latin American cinema, with an emphasis on post–World War II films produced in Cuba, Argentina, Brazil, and Mexico. Examination of each film in its historical and aesthetic aspects, and in light of questions concerning national cinema and "third cinema." Examples from both pre-1945 and contemporary films. Conducted in English; knowledge of Spanish and Portuguese helpful but not required. HU

* **PLSC 152a / EP&E 245a, Global Firms and National Governments** Joseph LaPalombara

Interactions between large-scale firms that make international investments and policy makers and government officials in the "host" countries. National and subnational officials who work to attract investments (or not) and who set policies regulating global firms and their investments. Focus on less-developed countries. Theories as to why firms "globalize"; case studies of controversies created by overseas corporate investments; the changing economic landscape associated with investments by countries such as China, Brazil, and India. SO

* **PLSC 415b / EP&E 241 / SOCY 172b, Religion and Politics in the World** Katharine Baldwin

A broad overview of the relationship between religion and politics around the world, especially Christianity and Islam. Religions are considered to constitute not just theologies but also sets of institutions, networks, interests, and sub-cultures. The course's principal aim is to understand how religion affects politics as an empirical matter, rather than to explore moral dimensions of this relationship. SO

SPAN 246b, Introduction to the Cultures of Spain Leslie Harkema

Study of various aspects of Spanish culture, including its continuing relation to the societies of Latin America. Examination of Spanish politics, history, religions, art forms, music, and literatures, from ancient times to the present. Primary sources and critical studies are read in the original. L5, HU

Directed Reading and Senior Essay Courses

*** LAST 471a, Directed Reading** Staff

For students who wish to investigate an area of Latin American Studies not covered by regular offerings. The project must terminate with a term paper or its equivalent. No more than one term of credit may be earned. To apply for admission, a student should present a prospectus and a bibliography to the director of undergraduate studies no later than one day before the course selection period concludes. Written approval from the faculty member who will direct the student's reading and writing must accompany the prospectus.

*** LAST 491a or b, The Senior Essay** Staff

Preparation of a research paper about forty pages long under the direction of a faculty adviser, in either the fall or the spring term. Students write on subjects of their own choice. During the term before the essay is written, students plan the project in consultation with a qualified adviser or the director of undergraduate studies. The student must submit a suitable project outline and bibliography to the adviser and the director of undergraduate studies by the third week of the term. The outline should indicate the focus and scope of the essay topic, as well as the proposed research methodology. Permission may be given to write a two-term essay after consultation with an adviser and the director of undergraduate studies and after submission of a project statement. Only those who have begun to do advanced work in a given area are eligible. The requirements for the one-term senior essay apply to the two-term essay, except that the two-term essay should be substantially longer.

Linguistics

Director of undergraduate studies: Jim Wood (jim.wood@yale.edu), 304 DOW, 432-2454; ling.yale.edu

Linguistics is the scientific study of language. The major in Linguistics offers a program of study leading toward an understanding of phonological, grammatical, and semantic structure and of various approaches to descriptive, experimental, and historical linguistics. Majors may concentrate on theoretical, experimental, or computational linguistics, on various aspects of comparative grammar, or on a particular family of languages. Interested students should consult the director of undergraduate studies (DUS).

COURSES FOR NONMAJORS AND MAJORS

Students with no previous background in linguistics are encouraged to approach the field by taking a 100-level course.

REQUIREMENTS OF THE MAJOR

The major requires twelve term courses in linguistics and related areas, distributed as follows:

1. Breadth requirement (four courses). All majors must take a course in each of the core areas of phonology (LING 232) and syntax (LING 253). In addition, at least one course must be taken in any two of the six remaining core areas of linguistics: phonetics, morphology, semantics/pragmatics, computational linguistics, language and mind/brain, and historical linguistics.
2. Depth requirement (two courses). In one of the eight core areas of linguistics, students must take two additional courses beyond the introductory level.
3. Electives (four courses). Four additional courses relating to linguistics are required, at least one of which must be at the 200 level or above. Electives may be chosen from courses offered by the Linguistics department or, with approval of the DUS, from related courses in programs such as Anthropology, Classics, Cognitive Science, Computer Science, English, Philosophy, Psychology, or foreign languages.
4. Research requirement (one course). LING 490, Research Methods in Linguistics, is required and is usually taken in the fall term of the senior year.

SENIOR REQUIREMENT

Senior requirement (one course). Students attend a research colloquium and write a senior essay in LING 491 during the spring term of the senior year.

ADVISING

Combined B.A./M.A. degree program Exceptionally able and well-prepared students may complete a course of study leading to the simultaneous award of the B.A. and M.A. degrees after eight terms of enrollment. See Academic Regulations, section K, Special Arrangements, "Simultaneous Award of the Bachelor's and Master's Degrees." Interested students should consult the director of undergraduate studies prior to the sixth term of enrollment for specific requirements in Linguistics.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 12 term courses (incl senior req)

Specific courses required LING 232, 253, 490

Distribution of courses 1 course each in 2 addtl core areas, as specified; 2 addtl courses beyond intro level in 1 core area; 4 electives, at least 1 at the 200 level or above

Substitution permitted Electives from related programs with DUS approval

Senior requirement LING 491

FACULTY OF THE DEPARTMENT OF LINGUISTICS

Professors Claire Bovern, Veneeta Dayal, Robert Frank, Laurence Horn (*Emeritus*), †Frank Keil, †Joshua Knobe, †Jason Stanley, †Zoltán Szabó, Petronella Van Deusen-Scholl (*Adjunct*), Raffaella Zanuttini (*Chair*)

Associate Professors Maria Piñango, Kenneth Pugh (*Adjunct*)

Assistant Professors Jason Shaw, Natalie Weber, Jim Wood

Lector Michael Barrett

Lecturer Chelsea Sanker

†A joint appointment with primary affiliation in another department.

Introductory Courses

Courses in this group do not require previous study of linguistics.

* **LING 077a, Mapping the Dialects of American English** Jim Wood

We all know that languages have different regional dialects, and American English is no exception. But what are the dialects of American English, and how are they determined? Does every town have its own dialect, or are there broader patterns across larger regions? Are the patterns different for different demographic categories? Are there different dialect regions depending on gender? Race? How do we know where one dialect region stops and another begins? It turns out that there is no one answer to these questions. Moreover, the answers we find depend greatly on what aspect of language we are looking at. This hands-on seminar explores different ways of visualizing how language varies across geographical space, with a focus on dialect variation. Students study recent research discussing new techniques for analyzing geographic patterns of linguistic variation, and apply those techniques to survey data collected in recent years by the Yale Grammatical Diversity Project. Students develop their own mapping projects based on these data, and discover novel ways to visualize and analyze regional dialect variation. The course involves an introduction to some basic concepts in linguistics, as well as an introduction to Geographic Information Systems (GIS) software. SO

LING 110a, Language: Introduction to Linguistics Jason Shaw

The goals and methods of linguistics. Basic concepts in phonology, morphology, syntax, and semantics. Techniques of linguistic analysis and construction of linguistic models. Trends in modern linguistics. The relation of linguistics to psychology, logic, and other disciplines. SO

LING 112b, Historical Linguistics Staff

Introduction to language change and language history. Types of change that a language undergoes over time: sound change, analogy, syntactic and semantic change,

borrowing. Techniques for recovering earlier linguistic stages: philology, internal reconstruction, the comparative method. The role of language contact in language change. Evidence from language in prehistory. WR, HU

* **LING 115a / SKRT 110a, Introductory Sanskrit I** Aleksandar Uskokov

An introduction to Sanskrit language and grammar. Focus on learning to read and translate basic Sanskrit sentences in Devanagari script. No prior background in Sanskrit assumed. L1 1½ Course cr

LING 116b / CGSC 216b / PSYC 116b, Cognitive Science of Language Robert Frank

The study of language from the perspective of cognitive science. Exploration of mental structures that underlie the human ability to learn and process language, drawing on studies of normal and atypical language development and processing, brain imaging, neuropsychology, and computational modeling. Innate linguistic structure vs. determination by experience and culture; the relation between linguistic and nonlinguistic cognition in the domains of decision making, social cognition, and musical cognition; the degree to which language shapes perceptions of color, number, space, and gender. SO

LING 125b / SKRT 120b, Introductory Sanskrit II Aleksandar Uskokov

Continuation of SKRT 110. Focus on the basics of Sanskrit grammar; readings from classical Sanskrit texts written in Devanagari script. After SKRT 110. L2 1½ Course cr

LING 138a / SKRT 130a, Intermediate Sanskrit I Aleksandar Uskokov

The first half of a two-term sequence aimed at helping students develop the skills necessary to read texts written in Sanskrit. Readings include selections from the *Hitopadesa*, *Kathasaritsagara*, *Mahabharata*, and *Bhagavadgita*. After SKRT 120 or equivalent. L3

LING 146b / PSYC 329b, Language, Sex, and Gender Natalie Weber and Claire Bowers

Sex-based asymmetries in language structure and language use. Role of language in encoding, reflecting, or reinforcing social attitudes and behavior. The "he/man" lexicon: sex-marking, reform, and resistance. Gender and sexual diversity as linguistic variables. Genderlects: differences (real and perceived) between male and female speech, conversational styles, and linguistic communities. SO RP

LING 148b / SKRT 140b, Intermediate Sanskrit II Aleksandar Uskokov

Continuation of SKRT 130, focusing on Sanskrit literature from the *kavya* genre. Readings include selections from the *Jatakamala* of Aryasura and the opening verses of Kalidasa's *Kumarasambhava*. After SKRT 130 or equivalent. L4

* **LING 150a / ENGL 150a, Old English** Alexandra Reider

An introduction to the language, literature, and culture of earliest England. A selection of prose and verse, including riddles, heroic poetry, meditations on loss, a dream vision, and excerpts from *Beowulf*, which are read in the original Old English. HU

American Sign Language Courses

ASL 110a, American Sign Language I Staff

An introduction to American Sign Language (ASL), with emphasis on vocabulary, ASL grammar, Deaf Culture and Conversational skills. Use of visual material (DVD),

communicative activities, grammar drills, classifiers and Deaf Culture study. ASL 120 is not required to earn credit for ASL 110. L1 1½ Course cr

ASL 120b, American Sign Language II Staff

A continuation to American Sign Language (ASL) I, with emphasis on ASL grammar, expressive and receptive skills in storytelling and dialogues. Use of visual materials (DVD), grammar drills, proper use of non-manual markers and body language. Emphasis on character development, role shifting and story cohesion. Prerequisite: ASL 110. L2 1½ Course cr

* **ASL 130a, American Sign Language III** Staff

Building on ASL 120, this course covers in depth the structure of ASL grammar, fingerspelling, narratives, and visual communication. Students develop expressive and receptive skills in storytelling and dialogue. Prerequisites: ASL 120 or a placement evaluation by professor. L3 1½ Course cr

* **ASL 140b, American Sign Language IV** Jessica Tanner

Building on ASL 130, this course increases the emphasis on more abstract and challenging conversational and narrative range; cultural values and behavioral roles of the deaf community in the U.S.; receptive and expressive activities, including vocabulary, grammatical structures, and aspects of the Deaf Culture in debate format. Prerequisite: ASL 130; or as evaluated by professor. L4 1½ Course cr

Intermediate Courses

Some courses in this group have prerequisites; others do not, and may be taken as a student's first course in linguistics.

* **LING 202a, The Mystery of the Voynich Manuscript** Claire Bower

Introduction to basic ideas of linguistics and cryptography through the study of the Voynich Manuscript (MS 408), a mysterious medieval manuscript held in the Beinecke Library. Review of major hypotheses about the manuscript, ranging from the fake, to code, to undeciphered language. SO

* **LING 212a, Linguistic Change** Claire Bower

How languages change, how we study change, and how language relates to other areas of society. This seminar is taught through readings chosen by instructor and students, on topics of interest. Prerequisite: LING 112 or equivalent. SO

LING 217a / EDST 237a / PSYC 317a, Language and Mind Maria Piñango

The structure of linguistic knowledge and how it is used during communication. The principles that guide the acquisition of this system by children learning their first language, by children learning language in unusual circumstances (heritage speakers, sign languages) and adults learning a second language, bilingual speakers. The processing of language in real-time. Psychological traits that impact language learning and language use. SO RP

* **LING 232a, Introduction to Phonological Analysis** Natalie Weber

The structure of sound systems in particular languages. Phonemic and morphophonemic analysis, distinctive-feature theory, formulation of rules, and problems of rule interpretation. Emphasis on problem solving. Prerequisite: LING 220, or a grade of B or above in LING 110. SO

* **LING 235b, Phonological Theory** Natalie Weber

Topics in the architecture of a theory of sound structure. Motivations for replacing a system of ordered rules with a system of ranked constraints. Optimality theory: universals, violability, constraint types and their interactions. Interaction of phonology and morphology, as well as the relationship of phonological theory to language acquisition and learnability. Opacity, lexical phonology, and serial versions of optimality theory. Prerequisite: LING 232 or permission of instructor. SO RP

* **LING 236a, Articulatory Phonology** Jason Shaw

Study of experimental methods to record articulatory movements using electromagnetic articulography and/or ultrasound technologies and analytical approaches for relating articulatory movements to phonological structure. Hands-on training in laboratory techniques are paired with discussion of related experimental and theoretical research. Prerequisites: LING 220 and LING 232 or permission of instructor. SO

* **LING 241b, Field Methods** Staff

Principles of phonetics, phonology, morphology, syntax, and semantics applied to the collection and interpretation of novel linguistic data. Data are collected and analyzed by the class as a group, working directly with a speaker of a relatively undocumented language. Open to majors and graduate students in Linguistics, and to others with permission of instructor. Students should have taken LING 232 or LING 220 and one other linguistics class. SO

LING 253a, Syntax I Raffaella Zanuttini

If you knew all the words of a language, would you be able to speak that language? No, because you'd still need to know how to put the words together to form all and only the grammatical sentences of that language. This course focuses on the principles of our mental grammar that determine how words are put together to form sentences. Some of these principles are shared by all languages, some differ from language to language. The interplay of the principles that are shared and those that are distinct allows us to understand how languages can be very similar and yet also very different at the same time. This course is mainly an introduction to syntactic theory: it introduces the questions that the field asks, the methodology it employs, some of the main generalizations that have been drawn and results that have been achieved. Secondly, this course is also an introduction to scientific theorizing: what it means to construct a scientific theory, how to test it, and how to choose among competing theories. SO

LING 254b, Syntax II Jim Wood

Recent developments in the principles and parameters approach to syntactic theory. In-depth exploration of theoretical and empirical issues in long-distance dependencies (island effects, dependency types, movement vs. binding), the character of syntactic structure (constituency, thematic mapping, functional categories), and the architecture of grammatical derivations (logical form, operations for structure building, anaphora). Prerequisite: LING 253. SO

LING 263a, Semantics I Veneeta Dayal

Introduction to truth-conditional compositional semantics. Set theory, first- and higher-order logic, and the lambda calculus as they relate to the study of natural language meaning. Some attention to analyzing the meanings of tense/aspect markers, adverbs, and modals. QR, SO

* **LING 266b, Cognitive Foundations of Meaning Change** Maria Piñango
Linguistic, cognitive, and communicative structure explored through phenomena involving systematic semantic change. Why evolution in the meanings of forms follows what seem to be constrained trajectorial paths. Whether such semantic change derives from the organizational properties of the human cognitive system or the dynamics of rational communication. Prerequisite or corequisite: LING 112, 231, 263, 275, or 361. SO

LING 271b / PHIL 271b, Philosophy of Language Jason Stanley
An introduction to contemporary philosophy of language, organized around four broad topics: meaning, reference, context, and communication. Introduction to the use of logical notation. HU

LING 275b, Pragmatics Laurence Horn
Context-dependent aspects of meaning and inference. Speech act theory, presupposition, implicature. Role of pragmatics in the lexicon and in meaning change. The semantics-pragmatics distinction from different perspectives; the position of pragmatics in linguistic theory. SO RP

Advanced Courses and Seminars

* **LING 372a, Meaning, Concepts, and Words** Maria Piñango
A cognitive approach to the structure of meaning from the perspective of the language system. The brain's finite collection of stored concepts, which are combined and recombined via predetermined principles. The system of associating combinations of concepts with combinations of words and sentences to produce an unlimited number of novel thoughts. Prerequisite: at least one course in linguistics, psychology, or cognitive science. SO

* **LING 380b, Topics in Computational Linguistics: Neural Network Models of Linguistic Structure** Robert Frank
An introduction to the computational methods associated with "deep learning" (neural network architectures, learning algorithms, network analysis). The application of such methods to the learning of linguistic patterns in the domains of syntax, phonology, and semantics. Exploration of hybrid architectures that incorporate linguistic representation into neural network learning. Prerequisites: Python programming, basic calculus and linear algebra, introduction to linguistic theory (LING 106, 110, 116, 217 or equivalent). QR, SO

* **LING 381a / LING 379 / LING 781a, Argument Structure and Morphology** Jim Wood
The intersection of argument structure and morphology. We study the ways that different argument structure configurations are reflected in the morphological shape of verbs (passives, causatives, reflexives, etc.), and how argument structure interacts with derivation, especially nouns and adjectives formed from verbs. Prerequisite: LING 253 or permission of the instructor. WR, SO

Research Courses and Senior Essay

* **LING 490a / PSYC 372a, Research Methods in Linguistics** Raffaella Zanuttini
Development of skills in linguistics research, writing, and presentation. Choosing a research area, identifying good research questions, developing hypotheses, and presenting ideas clearly and effectively, both orally and in writing; methodological

issues; the balance between building on existing literature and making a novel contribution. Prepares for the writing of the senior essay.

* **LING 491b, The Senior Essay** Jim Wood

Research and writing of the senior essay under the guidance of a faculty adviser. Students present research related to their essays in a weekly colloquium. Prerequisite: LING 490.

Related Courses

ANTH 205a / ANTH 368, Language, Culture, and Identity J. Joseph Errington

Introduction to the role of language in the constitution of gendered, class, ethnic, and national identities. Ethnographic and linguistic case studies are combined with theoretical and comparative approaches. Enrollment limited to 40. (Formerly ANTH 120) SO

* **ANTH 413a, Language, Culture, and Ideology** J. Joseph Errington

Review of influential anthropological theories of culture, with reference to theories of language that inspired or informed them. American and European structuralism; cognitivist and interpretivist approaches to cultural description; the work of Bakhtin, Bourdieu, and various critical theorists. SO RP

* **CHLD 128b / EDST 128b / PSYC 128b, Language, Literacy, and Play** Nancy Close and Carla Horwitz

The course focuses on the complicated role play has in the development of language and literacy skills among preschool and kindergarten-aged children. It examines how teachers integrate language, literacy, and play in a developmentally appropriate early childhood education curriculum. Topics include social-emotional, cross-cultural, cognitive, and communicative aspects of play. WR, SO RP

CPSC 472a, Intelligent Robotics Brian Scassellati

Introduction to the construction of intelligent, autonomous systems. Sensory-motor coordination and task-based perception. Implementation techniques for behavior selection and arbitration, including behavior-based design, evolutionary design, dynamical systems, and hybrid deliberative-reactive systems. Situated learning and adaptive behavior. After CPSC 201 and 202 or equivalents. May not be taken after CPSC 473. QR

CPSC 477b, Natural Language Processing Dragomir Radev

Linguistic, mathematical, and computational fundamentals of natural language processing (NLP). Topics include part of speech tagging, Hidden Markov models, syntax and parsing, lexical semantics, compositional semantics, machine translation, text classification, discourse, and dialogue processing. Additional topics such as sentiment analysis, text generation, and deep learning for NLP. Prerequisites: CPSC 202 and CPSC 223, or permission of instructor. QR

LATN 110a, Beginning Latin: The Elements of Latin Grammar Staff

Introduction to Latin. Emphasis on morphology and syntax within a structured program of readings and exercises. Prepares for LATN 120. No prior knowledge of Latin assumed. Preregistration, which is required, takes place at the Academic Fair. See the *Calendar for the Opening Days* or the departmental Web site for details about preregistration. L1 RP 1½ Course cr

* **LATN 390b, Latin Syntax and Stylistics** Joseph Solodow

A systematic review of syntax and an introduction to Latin style. Selections from Latin prose authors are read and analyzed, and students compose short pieces of Latin prose. For students with some experience reading Latin literature who desire a better foundation in forms, syntax, idiom, and style. L5, HU

PHIL 115a, First-Order Logic Kenneth Winkler

An introduction to formal logic. Study of the formal deductive systems and semantics for both propositional and predicate logic. Some discussion of metatheory. QR

PHIL 267b, Mathematical Logic Sun-Joo Shin

An introduction to the metatheory of first-order logic, up to and including the completeness theorem for the first-order calculus. Introduction to the basic concepts of set theory. Prerequisite: PHIL 115 or permission of instructor. QR

* **PHIL 427b, Computability and Logic** Sun-Joo Shin

A technical exposition of Gödel's first and second incompleteness theorems and of some of their consequences in proof theory and model theory, such as Löb's theorem, Tarski's undefinability of truth, provability logic, and nonstandard models of arithmetic. Prerequisite: PHIL 267 or permission of instructor. QR, HU

Literature

Directors of undergraduate studies: Moira Fradinge (moira.fradinger@yale.edu) [F]; Ayesha Ramachandran (ayesha.ramachandran@yale.edu) [S]; 451 College Street, 432-4751; registrar: Mary Jane Stevens (maryjane.stevens@yale.edu); complit.yale.edu/literature-major

The Literature and Comparative Cultures Major and the Comparative Literature Major allow students to address fundamental questions about the nature, function, and value of literature in a broadly comparative context. Students read and write about a wide variety of literary works across periods, genres, and national traditions. They investigate ancient and contemporary approaches to literary study, theories and methods of comparison, and the relationship of literature to film and other media. Majors have the freedom to construct a program of study that reflects their intellectual goals. All prospective majors should register with the director of undergraduate studies (DUS), who will work with them to develop a coherent sequence of courses suited to their individual interests.

The majors offer a number of their own courses, which constitute the core of the programs. Other courses are normally chosen from different language and literature programs, many of which offer courses on literature and film in translation. Among these programs are African American Studies, Classics, East Asian Languages and Literatures, English Language and Literature, Film and Media Studies, French, German Studies, Italian, Near Eastern Languages and Civilizations, Portuguese, Slavic Languages and Literatures, and Spanish. Students with a particular interest in film or literary translation may wish to elect the film track or translation track within the majors, as described below.

Prospective majors are strongly encouraged to begin the study of a foreign language as early as possible in their academic careers and to continue such study throughout their time at Yale. Students interested in graduate study in comparative literature should be aware that many programs require reading knowledge of two or three foreign languages.

REQUIREMENTS OF THE LITERATURE AND COMPARATIVE CULTURES MAJOR

This standard literature major requires twelve term courses, including the senior requirement. Prospective majors must take two junior seminars; LITR 130 and one of LITR 140, 143, or 348. Students in the film track must take LITR 143 and students in the translation track must take LITR 348 (or equivalent approved by DUS). Beyond the two required courses and the senior essay, the major requires nine term courses. These include three courses in a foreign literature (see below), three courses that fulfill the period requirement (see below), and three elective courses. One of the electives must involve a significant element of literary or cultural theory. All three elective courses may be taken in any literature department and may include two courses in a related discipline that has direct bearing on the student's program of study in literature, such as history of art, philosophy, anthropology, music, or theater studies. One of the elective courses may be in creative writing or directed studies.

Foreign literature requirement All majors are required to take at least three courses, one of which may award the language distributional requirement (L5), in an ancient or modern foreign literature, in which the literature is read in the original language. Two courses can be taken at a basic literature level (normally equivalent to the third year of language study), but at least one course must be taken at an advanced level (normally equivalent to the fourth year of language study or higher).

A literature course in English translation is sometimes suitable as a foreign literature course. In such cases, majors are expected to request additional assignments from their instructors that demonstrate they have engaged with the texts in the original language. They should submit the appropriate form, signed by the instructor, attesting to their intent to do so. This form is available in the department office in Rm. 102, 451 College St.; students should submit it to the DUS along with their course schedule.

Non-native speakers of English who are granted permission by Yale College to complete the foreign language distributional requirement by taking ENGL 114, 115, 120, 121, or 450 may take three additional English literature courses to fulfill the foreign literature requirement of the Literature and Comparative Cultures Major, or they may fulfill the major requirements in a third language.

Period requirement Students are required to take at least one course in three of five historical periods: (1) Antiquity; (2) the Middle Ages; (3) the Renaissance; (4) 17th–18th centuries; and (5) the Modern period (1800–present). Courses taken from other departments (excluding Directed Studies) may fulfill the period requirement with DUS permission.

Theory requirement All students must take one elective course that involves a significant component of literary or cultural theory. Students who wish to know if a particular course, particularly those offered in other departments, may count toward this requirement should consult the DUS.

Film track Students in the film track must take LITR 143, and they must take two foreign literature courses rather than three (neither course may be substituted with an advanced language course). In addition, students in the film track must take one course in film theory and must choose their three electives from courses in film and media studies.

Translation track Students in the translation track must take LITR 348 and must also choose two of their three electives from courses that engage with some aspect of translation studies; the office of the DUS maintains a list of qualifying courses.

Credit/D/Fail A maximum of two courses taken Credit/D/Fail may count toward the major, with permission of the DUS. None of the specific required courses may be taken Credit/D/Fail.

SENIOR REQUIREMENT

In the senior essay, required of all majors, students develop a research topic of their choice and work closely with a faculty adviser, preferably from the department. Normally, the essay makes use of texts in the language of their original composition. Any exceptions must be approved by the DUS. Deadlines for the prospectus, the rough

draft, and the completed essay are listed in the course descriptions of the senior essay course (LITR 491, 492, 493).

The senior essay may be written over one term (LITR 491) or over two terms (LITR 492, 493). Students with an especially well-developed project may petition to write a yearlong senior essay. Interested juniors must apply to the DUS by the last day of classes in the spring term. Students may count the second term of the essay as one elective course toward the total number of courses required for the major. Students expecting to graduate in May enroll in LITR 492 during the fall term and complete their essays in 493 in the spring term. December graduates enroll in 492 in the spring term and complete their essays in 493 during the following fall term. Students planning to begin their essay in the spring term should notify the DUS by the last day of classes in the fall term.

REQUIREMENTS OF THE LITERATURE AND COMPARATIVE CULTURES MAJOR

Prerequisites None

Number of courses 12 term courses (incl senior req)

Specific courses required LITR 130; one of LITR 140, 143, or 348; *Film track*—LITR 143; *Translation track*—LITR 348 or equivalent

Distribution of courses *Standard major*—3 period courses, as specified; 3 courses in 1 foreign lit, as specified; 3 electives, as specified; *Film track*—3 period courses, 2 courses in 1 foreign lit, as specified; 1 course in film theory; 3 electives in film & media studies; *Translation track*—3 period courses, 3 courses in 1 foreign lit, as specified; 2 of 3 electives in translation studies

Substitution permitted *Standard and translation tracks*—1 lit course in English translation for 1 of 3 req lit courses, with DUS permission

Senior requirement One-term senior essay (LITR 491); or two-term senior essay (LITR 492 and LITR 493)

REQUIREMENTS OF THE COMPARATIVE LITERATURE MAJOR

This intensive literature major is similar to the standard major, with more specific foreign literature requirements; however, unlike the standard major, Comparative Literature majors must take LITR 130 and 140 and the latter may not be substituted for by taking LITR 143 or 348. The major requires twelve term courses, including two required junior seminars, LITR 130 and 140, the senior essay, and nine term courses, which include three courses that fulfill the period requirement, one elective that involves a significant element of literary or cultural theory, three courses in one foreign literature (one of which may be an L5 course) and two courses in a second foreign literature (one of which may be an L5 course). In all five of the foreign literature courses, the literature must be read in the original language.

Period requirement Students are required to take at least one course in three of five historical periods: 1) Antiquity; 2) the Middle Ages; 3) the Renaissance; (4) 17th–18th centuries; and (5) the Modern period (1800–present). Courses taken from other departments (excluding Directed Studies) may fulfill the period requirement with DUS permission.

Theory requirement All students must take one elective course that involves a significant component of literary or cultural theory. Students who wish to know if a

particular course, particularly those offered in other departments, may count toward this requirement should consult the DUS.

Credit/D/Fail A maximum of two courses taken Credit/D/Fail may count toward the major, with permission of the DUS. None of the specific required courses may be taken Credit/D/Fail.

SENIOR REQUIREMENT

In the senior essay, required of all majors, students develop a research topic of their choice and work closely with a faculty adviser, preferably from the department. Normally, the essay makes use of texts in the language of their original composition. Any exceptions must be approved by the DUS. Deadlines for the prospectus, the rough draft, and the completed essay are listed in the course descriptions of the senior essay course (LITR 491, 492, 493).

The senior essay may be written over one term (LITR 491) or over two terms (LITR 492, 493). Students with an especially well-developed project may petition to write a yearlong senior essay. Interested juniors must apply to the DUS by the last day of classes in the spring term. Students may count the second term of the essay as one elective course toward the total number of courses required for the major. Students expecting to graduate in May enroll in LITR 492 during the fall term and complete their essays in 493 in the spring term. December graduates enroll in 492 in the spring term and complete their essays in 493 during the following fall term. Students planning to begin their essay in the spring term should notify the DUS by the last day of classes in the fall term.

REQUIREMENTS OF THE COMPARATIVE LITERATURE MAJOR

Prerequisites None

Number of courses 12 term courses (incl senior essay)

Specific courses required LITR 130, 140

Distribution of courses 3 period courses, as specified; 1 elective with literary or cultural theory element, as specified; 3 courses in one foreign litr, as specified; 2 courses in a second foreign litr, as specified

Senior requirement One-term senior essay (LITR 491); or two-term senior essay (LITR 492 and LITR 493)

STUDY ABROAD FOR BOTH MAJORS

Literature majors are encouraged to consider spending a summer, a term, or a year abroad. One course taken through international programs may, with permission of the DUS, be applied to the foreign literature requirement.

UNIQUE TO BOTH MAJORS

The following table lists languages in which advanced literature instruction is available at Yale, specifying courses that fulfill the basic and advanced literature requirements for the majors. Courses with numbers higher than those listed also normally fulfill the requirement, providing that they focus on literature (rather than language) and that the literature is read in the original language.

Other ancient and modern languages, including those from Africa, South Asia, and the Middle East, may be suitable for either major if a qualified faculty adviser is available to supervise the student.

Language	Basic Literature Course	Advanced Literature Course
Arabic	ARBC 150, 151	ARBC 161 or 165
Chinese	CHNS 150, 151	CHNS 170 or 171
French	FREN 170	Courses in French numbered 200 or higher
German	Courses in German numbered 170 or higher	Courses in German numbered 200 or higher
Ancient Greek	GREK 131 or 141	Ancient Greek courses numbered 400 or higher
Modern Hebrew	By arrangement with instructor	By arrangement with instructor
Italian	Courses in Italian numbered 200 or higher	Courses in Italian numbered 200 or higher
Japanese	JAPN 150, 151	JAPN 170 or 171
Korean	KREN 150, 151	EALL 470 or 471
Latin	LATN 131 or 141	Latin courses numbered 400 or higher
Persian	PERS 150	PERS 150
Portuguese	By arrangement with instructor	By arrangement with instructor
Russian	RUSS 150, 151	Courses in Russian numbered 170 or higher
Spanish	SPAN 261, 262, 266, or 267	Courses in Spanish numbered 300 or higher

FACULTY OF THE DEPARTMENT OF COMPARATIVE LITERATURE

Professors Dudley Andrew, Peter Brooks (*Emeritus*), Rüdiger Campe, Katerina Clark, Roberto González Echevarría, Martin Hägglund, Hannan Hever, Carol Jacobs (*Emeritus*), Pericles Lewis, Rainer Nägele (*Emeritus*), David Quint, Katie Trumpener, Jing Tsu, Jane Tylus

Associate Professors Moira Fradinger, Ayesha Ramachandran

Assistant Professors Robyn Creswell, Marta Figlerowicz

Senior Lecturer Peter Cole

Lecturers Jan Hagens, George Syrimis

Senior Lector Candace Skorupa

Affiliated Faculty Rolena Adorno (*Spanish & Portuguese*), R. Howard Bloch (*French*), Francesco Casetti (*Film & Media Studies*), Kang-i Sun Chang (*East Asian Languages & Literatures*), Michael Denning (*American Studies*), Wai Chee Dimock (*English*), Paul Fry (*English*), Alice Kaplan (*French*), Tina Lu (*East Asian Languages & Literatures*), John MacKay (*Slavic Languages & Literatures*), Giuseppe Mazzotta (*Italian*), Christopher L.

Miller (*French*), Joseph Roach (*English*), Maurice Samuels (*French*), Ruth Yeazell (*English*)

First-Year Seminar

* LITR 022a, **Music and Literature** Candace Skorupa

This seminar explores the rivalry between music and literature, the attraction and repulsion between these two art forms, and the dialogue between writers and composers. In select fiction and poetry spanning a variety of cultures and times, we look at the aesthetic challenges of conveying music in words; in select music from the same periods, we study the use of literary themes and narrative. How does music inhabit literature, and literature influence music? We read fiction describing music and borrowing musical forms; we study symphonies and opera inspired by literature; we look at films that bring together these two arts. Students examine theoretical approaches and learn comparative methods useful for literature and culture courses. Though not required, musical experience and/or interest is welcomed for the seminar, which may be taken simultaneously with gateway courses in the humanities. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

* LITR 023a / ENGL 025a / SAST 059a, **Modern South Asian Literature, 1857-2017**

Priyasha Mukhopadhyay

Exploration of literary texts from South Asia, 1857 to the present. Close reading of literary texts from India, Pakistan, Bangladesh, and Sri Lanka, alongside political speeches, autobiographies, and oral narratives. Topics include colonialism, history writing, migration, language, caste, gender and desire, translation, politics and the novel. Enrollment limited to first-year students. Preregistration is required; see under First-Year Seminar Program. WR, HU

* LITR 024b / GMAN 051b, **Game of Thrones and the Theory of Sovereignty** Kirk Wetters

Introduction to the classical and modern theory of sovereignty in the context of G.R.R. Martin's popular *Game of Thrones* series (primarily the books, which are formally more complex and narratively more sophisticated than the television series). Although *The Game of Thrones* is obviously not a work of German literature, it addresses theoretical and literary-historical discourses that are prominently represented in the German context. Emphasis on strategies of literary and theoretical analysis; literature as a testing ground for theoretical models; theory as an analytic framework for evaluating literary and cultural depictions. Questioning the basis of the contemporary relevance and popularity of this material in light of questions of tragedy, individual agency, myth (vs. history), realism (vs. fantasy), environmental catastrophe and geopolitics. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR

Prerequisites and Required Courses

* LITR 130a / HUMS 130a, **How to Read** Ayesha Ramachandran

Introduction to techniques, strategies, and practices of reading through study of lyric poems, narrative texts, plays and performances, films, new and old, from a range of times and places. Emphasis on practical strategies of discerning and making meaning, as well as theories of literature, and contextualizing particular readings. Topics include

form and genre, literary voice and the book as a material object, evaluating translations, and how literary strategies can be extended to read film, mass media, and popular culture. Junior seminar; preference given to juniors and majors. HU

The Ancient World

* LITR 154a / ENGL 395a, **The Bible as a Literature** Leslie Brisman

Study of the Bible as a literature—a collection of works exhibiting a variety of attitudes toward the conflicting claims of tradition and originality, historicity and literariness. The course should not be taken concurrently with RLST 145 and is not open to first-year students; but it is open to non-majors who have taken a prior WR course or others who are eager to profit from the progress possible from one to another of the five writing assignments. WR, HU RP

* LITR 168a / ENGL 129a, **Tragedy in the European Literary Tradition** Staff

The genre of tragedy from its origins in ancient Greece and Rome through the European Renaissance to the present day. Themes of justice, religion, free will, family, gender, race, and dramaturgy. Works include Homer's *Iliad* and plays by Aeschylus, Sophocles, Euripides, Seneca, Shakespeare, Racine, Ibsen, Chekhov, Brecht, Beckett, and Soyinka. Focus on textual analysis and on developing the craft of persuasive argument through writing. WR, HU

* LITR 169b / ENGL 130b, **Epic in the European Literary Tradition** Staff

The epic tradition traced from its foundations in ancient Greece and Rome to the modern novel. The creation of cultural values and identities; exile and homecoming; the heroic in times of war and of peace; the role of the individual within society; memory and history; politics of gender, race, and religion. Works include Homer's *Odyssey*, Vergil's *Aeneid*, Dante's *Inferno*, Cervantes's *Don Quixote*, and Joyce's *Ulysses*. Focus on textual analysis and on developing the craft of persuasive argument through writing. WR, HU

Medieval and Early Modern Literature to 1800

LITR 174a / EALL 211a / EAST 241a / WGSS 405a, **Women and Literature in Traditional China** Kang-i Sun Chang

A study of major women writers in traditional China, as well as representations of women by male authors. The power of women's writing; women and material culture; women in exile; courtesans; Taoist and Buddhist nuns; widow poets; cross-dressing women; the female body and its metaphors; footbinding; notions of love and death; the aesthetics of illness; women and revolution; poetry clubs; the function of memory in women's literature; problems of gender and genre. All readings in translation; no knowledge of Chinese required. Some Chinese texts provided for students who read Chinese. Formerly CHNS 201. HU

LITR 183a / HUMS 180a / ITAL 310a, **Dante in Translation** Christiana Purdy Moudarres

A critical reading of Dante's *Divine Comedy* and selections from the minor works, with an attempt to place Dante's work in the intellectual and social context of the late Middle Ages by relating literature to philosophical, theological, and political concerns. No knowledge of Italian required. Course conducted in English. HU TR

LITR 194a / ENGL 154a / FREN 216a / HUMS 134a, The Multicultural Middle Ages
Ardis Butterfield

Introduction to medieval English literature and culture in its European and Mediterranean context, before it became monolingual, canonical, or author-bound. Genres include travel writing, epic, dream visions, mysticism, the lyric, and autobiography, from the Crusades to the Hundred Years War, from the troubadours to Dante, from the *Chanson de Roland* to Chaucer. HU

European Literature since 1800

* **LITR 201b / GMAN 247b, Goethe's Wilhelm Meister** Kirk Wetters

A detailed study of Goethe's 1795/96 *Wilhelm Meister's Apprenticeship* – the first novel of the nineteenth century and the prototypical novel of education (*Bildungsroman*); engagement with critical and scholarly reception starting with Schiller and Schlegel, theories of the novel and transformations of modern society. Readings and discussion in English. HU TR

LITR 202b / RUSS 260b, Nabokov and World Literature Marijeta Bozovic
Vladimir Nabokov's writings explored in the context of his life story and of the structures and institutions of literary life in Russian émigré circles. Themes of exile, memory, and nostalgia; hybrid cultural identities and cosmopolitan elites; language and bilingualism; the aims and aesthetics of émigré and diasporic modernism in novels and other media. Additional readings from works of world literature inspired and influenced by Nabokov. Readings and discussion in English. WR, HU

LITR 214b / FREN 240b / HUMS 201b, The Modern French Novel Maurice Samuels and Alice Kaplan

A survey of major French novels, considering style and story, literary and intellectual movements, and historical contexts. Writers include Balzac, Flaubert, Proust, Camus, and Sartre. Readings in translation. One section conducted in French. HU TR

* **LITR 218a / GMAN 226a, The Faust Tradition** Jan Hagens

The development of the Faust motif through time, from the period of the Renaissance and the Reformation to the twentieth century. Readings from the English adaptation of the original German chapbook and from works by Marlowe, Ben Jonson, Goethe, Wilde, Bulgakov, and Thomas Mann. Screenings of films with a Faustian theme. HU

* **LITR 220b / CZEC 301b / RSEE 300b, Milan Kundera: The Czech Novelist and French Thinker** Karen von Kunes

Close reading of Kundera's novels, with analysis of his aesthetics and artistic development. Relationships to French, German, and Spanish literatures and to history, philosophy, music, and art. Topics include paradoxes of public and private life, the irrational in erotic behavior, the duality of body and soul, the interplay of imagination and reality, the function of literary metaphor, and the art of composition. Readings and discussion in English. HU TR

* **LITR 239a / CLCV 216a / MGRK 216a / WGSS 209a, Dionysus in Modernity**
George Syrimis

Modernity's fascination with the myth of Dionysus. Questions of agency, identity and community, and psychological integrity and the modern constitution of the self. Manifestations of Dionysus in literature, anthropology, and music; the Apollonian-

Dionysiac dichotomy; twentieth-century variations of these themes in psychoanalysis, surrealism, and magical realism. HU TR

LITR 245a / RSEE 254a / RUSS 254a, Tolstoy and Dostoevsky Molly Brunson
Close reading of major novels by two of Russia's greatest authors. Focus on the interrelations of theme, form, and literary-cultural context. Readings and discussion in English. HU

* **LITR 302b / FREN 307b, France by Rail: Trains in French Literature, Film, and History** Morgane Cadieu
Exploration of the aesthetics of trains in French and Francophone literature and culture, from the end of the nineteenth-century and the first locomotives, to the automatically driven subway in twenty-first century Paris. Focus on the role of trains in industrialization, colonization, deportation, decolonization, and immigration. Corpus includes novels, poems, plays, films, paintings, graphic novels, as well as theoretical excerpts on urban spaces and public transportation. Activities include: building a train at the CEID and visiting the Beinecke collections and the Art Gallery. May not be taken after FREN 306. WR, HU

Non-European Literature since 1800

* **LITR 252a / PORT 350a, Machado de Assis** K. David Jackson
The place of Machado de Assis in world literature explored through close reading of his nine novels and selected stories in translation. Machado's hybrid literary world, skeptical critique of empire in Brazil, and narrative constructions. Readings and discussion in English; reading of texts in Portuguese for Portuguese majors. WR, HU
TR

* **LITR 285a / EALL 286a / EAST 261a / HUMS 290a / PORT 360a, The Modern Novel in Brazil and Japan** Seth Jacobowitz
Brazilian and Japanese novels from the late nineteenth century to the present. Representative texts from major authors are read in pairs to explore their commonalities and divergences. Topics include nineteenth-century realism and naturalism, the rise of mass culture and the avant-garde, and existentialism and postmodernism. No knowledge of Portuguese or Japanese required. HU

* **LITR 294a / LAST 394a / PORT 394a, World Cities and Narratives** K. David Jackson
Study of world cities and selected narratives that describe, belong to, or represent them. Topics range from the rise of the urban novel in European capitals to the postcolonial fictional worlds of major Portuguese, Brazilian, and Spanish American cities. Conducted in English. WR, HU TR

Literary Theory and Special Topics

* **LITR 179a / ENGL 219a / HUMS 149a / ITAL 309a / WGSS 179a, Gender and Genre in Renaissance Love Poetry** Ayesha Ramachandran
Introduction to the poetic genres of lyric, epic, and pastoral in the European Renaissance. Focus on questions of desire, love, and gendered subjectivity. The historical contexts and political uses of discourses of eroticism and pleasure in Italy, Spain, France, and England. Written exercises include poetic imitations of Renaissance texts. HU

* **LITR 306a / FILM 409a / RSEE 327a / RUSS 327a, The Danube in Literature and Film** Marijeta Bozovic

The Danube River in the film, art, and literature of various Danubian cultural traditions, from the late nineteenth century to the present. Geography and history of the region that includes the river's shores and watershed; physical, historical, and metaphoric uses of the Danube; the region as a contested multilingual, multicultural, and multinational space, and as a quintessential site of cross-cultural engagement. Readings and discussion in English. WR, HU TR

* **LITR 317a / JDST 326a, Marxist Theory of Literature** Hannan Hever

The role of Marxist thought in understanding literary institutions and texts in the twentieth century. Marx's theory of ideology; Lukacs's theory of literature as the basis for development of Marxist literary theory; the Frankfurt and materialistic schools. Readings include works by Raymond Williams, Catherine Belsey, Walter Benjamin, Pierre Macherey, and Frederic Jameson. HU

LITR 318a / ENGL 191a / NELC 201a, The Arabian Nights, Then and Now Shawkat Toorawa

Exploration of *Arabian Nights*, a classic of world literature. Topics include antecedents, themes and later prose, and graphic and film adaptations. HU

* **LITR 324b / HUMS 320 / THST 330b, Representations of the Underworld** Toni Dorfman

What is the underworld? What questions have different ideas about the underworld posed about mortality, freedom, and goodness? Topics include dreams, hell, ghosts, the unconscious, and string theory. Sophomore standing required. HU

* **LITR 327a / ITAL 367a, Saying Goodbye: Meditations on Art, Death and Afterlives, the Bible through Shakespeare and Sor Juan** Jane Tylus

How do we take leave of the people, places, and work that we love? Our course objectives are to strive to understand the important role that leavetakings play in life and artistic expression, especially between 1300-1700; to probe the differences between religious faiths of early modernity with respect to rituals of saying goodbye and the afterlife; to sharpen our skills as readers, spectators, and listeners of works that engage with complex questions regarding the meaning of life and one's lifework; and to contextualize our readings within more contemporary conversations by theologians and theorists about dying, grief, and letting go. We also examines rites of passage and departure, even as our main focus is figures such as Dante, Michelangelo, Montaigne, Shakespeare, and Sor Juana Inés de la Cruz, whose differing faiths during a period of religious crisis produced various kinds of finished—and unfinished—works. Our class is held in the Beinecke library, where we regularly consult first editions and in some cases (Donne's letters and poems) autograph copies, as well as evaluate the material evidence for ways that manuscripts and books reveal how authors parted with their works (dedications, envois), and how readers comment on their own encounters with leavetakings. WR, HU

LITR 329a / AFAM 180a / LAST 398a / SPAN 398a, Caribbean Baseball: A Cultural History Roberto González Echevarría

A study of the origins and evolution of baseball in the Caribbean (Cuba, Dominican Republic, Puerto Rico) in the context of the region's political and cultural history and its relationship with the United States. The course begins with a consideration of the

nature of games and the development and dissemination of sports by imperial powers since the nineteenth century: soccer, rugby, and tennis by the UK and basketball and baseball by the U.S. Topics to be considered: nationalism, the role of race, popular culture, the development of the media, the rise of stars and famous teams, the importance of the Negro Leagues, access of Caribbean players to the Major Leagues, the situation in the present. WR, HU TR

* **LITR 330a / GMAN 227a / HUMS 330a / PHIL 402a, Heidegger's Being and Time**

Martin Hägglund

Systematic, chapter by chapter study of Heidegger's *Being and Time*, arguably the most important work of philosophy in the twentieth-century. All major themes addressed in detail, with particular emphasis on care, time, death, and the meaning of being. HU

LITR 339b / ENGL 159 / HUMS 213, Global Shakespeares: Race, Gender, and the Idea of the Human Ayesha Ramachandran

Shakespeare today is a global phenomenon: over five hundred years after his death, the playwright's legacy continues to flourish with new performances, reworkings, appropriations, and adaptations continuously produced across the world in a range of languages and across various media. Once exported along with the ideologies and practices of empire, Shakespeare's works have now become an index for the complex histories of colonialism and postcolonialism as well as a crucial site for studying processes of racialization and the universalizing idea of "the human." How did Shakespeare become global? Was the cultural imagination of his plays always already global, written at a time with the very notion of the modern world as we know was being shaped? This course explores the political afterlives of "Shakespeare" as a cultural icon and aesthetic touchstone for the Western tradition through a close reading of four plays alongside their adaptations: *Hamlet*, *Othello*, *King Lear*, and *Antony and Cleopatra*. We look at films, novels, *manga* comics, memoirs, stand-up comic routines, along with classic stagings of the plays to elucidate the themes that have made Shakespeare global – in particular, questions of race, gender, sexuality, generational conflict, and political intrigue. Authors and directors include Akira Kurosawa, Vishal Bharadwaj, Janet Suzman, Iqbal Khan, James Baldwin, Sulayman Al-Bassam, Tayeb Salih, Preti Taneja, and Derek Walcott. HU

* **LITR 342b / JDST 356b, Jewish Literary Masterpieces** Hannan Hever

Exploration of the nature of Jewish identity through a literary prism, focusing on novels, stories, poetry, and homilies. Study of texts written over a three thousand year period by Jews living in the Middle East, Europe, and America, from biblical writings through modern works composed by Franz Kafka, Philip Roth, as well as Israeli Literature. Special attention given to the role of gender, minority identities, and the idea of nationalism. Taught in translation, readings in English. HU RP

* **LITR 348b / ENGL 456b / HUMS 427b, The Practice of Literary Translation** Peter Cole

Intensive readings in the history and theory of translation paired with practice in translating. Case studies from ancient languages (the Bible, Greek and Latin classics), medieval languages (classical Arabic literature), and modern languages (poetic texts).

HU

Film

* **LITR 358a, East German Literature and Film** Katie Trumpener

The German Democratic Republic (1949-1989) was a political and aesthetic experiment that failed, buffeted by external pressures, and eroded by internal contradictions. For forty years, in fact, its most ambitious literary texts and films (some suppressed, others widely popular) explored such contradictions, often in a vigilant, Brechtian spirit of irony and dialectics. This course examines key texts both as aesthetic experiments and as critiques of the country's emerging cultural institutions and state censorship, recurrent political debates and pressing social issues. Texts by Brecht, Uwe Johnson, Heiner Müller, Christa Wolf, Johannes Bobrowski, Franz Fühmann, Wolf Biermann, Thomas Brasch, Christoph Hein; films by Slatan Dudow, Kurt Maetzig, Konrad Wolf, Heiner Carow, Frank Beyer, Jürgen Böttcher, Volker Koepp. Knowledge of German desirable but not crucial; all texts available in English. WR, HU

* **LITR 360a / FILM 363a, Radical Cinemas of Latin America** Moira Fradinger

Introduction to Latin American cinema, with an emphasis on post-World War II films produced in Cuba, Argentina, Brazil, and Mexico. Examination of each film in its historical and aesthetic aspects, and in light of questions concerning national cinema and "third cinema." Examples from both pre-1945 and contemporary films. Conducted in English; knowledge of Spanish and Portuguese helpful but not required. HU

* **LITR 361a / FILM 305a, Animation, Disney and Beyond** Aaron Gerow

Survey of the history and theory of animation. Examples from around the world, from various traditions, and from different periods. HU

* **LITR 364a / ENGL 384a / FILM 461a / THST 416a, British Cinema** Katie

Trumpener

Survey of the British film tradition, emphasizing overlap with literature, drama, and art; visual modernism; documentary's role in defining national identity; "heritage" filmmaking and alternative approaches to tradition; and auteur and actors' cinema. HU

RP

* **LITR 366b / FILM 416b / FREN 394b, French Cinema through the New Wave**

Dudley Andrew

The history of French cinema c. 1930 to 1970, from the onset of sound through the New Wave movement. The New Wave "idea of cinema"; the relation of cinema to national self-perception and state policy in France. HU RP

* **LITR 368a / FILM 319a / GMAN 273a, The Third Reich in Postwar German Film, 1945-2007** Jan Hagens

Close study of the intersection of aesthetics and ethics with regard to how German films, since 1945, have dealt with Nazi history. Through the study of German-language films (with subtitles), produced in postwar East, West, and unified Germany through 2007, students consider and challenge perspectives on the Third Reich and postwar Germany, while learning basic categories of film studies. HU

* **LITR 380b / FILM 411b, The Films of Alfred Hitchcock** Brigitte Peucker

An examination of Hitchcock's career as a filmmaker from *Blackmail* to *Frenzy*, with close attention to the wide variety of critical and theoretical approaches to his work. Topics include the status of the image; the representation of the feminine and of the

body; spectatorship; painterliness and theatricality; generic and psychoanalytic issues.

HU

* **LITR 398a / ENGL 308a / FILM 242a / HUMS 454a, Interpreting Film Masterpieces**

David Bromwich and Dudley Andrew

Exploration of seven auteurs from Europe and Hollywood, 1937–1967. Assessment of methods that deepen appreciation of the films and the medium. WR, HU

Advanced Seminars

Two seminars are required for Literature majors; nonmajors may be admitted with permission of the instructor.

* **LITR 403b / FILM 442b / RUSS 403b, The City in Literature and Film** Katerina

Clark

Consideration of the architecture, town planning, and symbolic functions of various cities in Europe, Latin America, the United States, and East Asia. Discussion of the representation of these cities in literature and film. Works include older Soviet and Chinese films about Shanghai and contemporary films about Hong Kong and Beijing.

HU

* **LITR 406b / ER&M 416b / GMAN 411b / HUMS 342b / JDST 327b, World**

Literature Hannan Hever

The concept of world literature, from its origins in eighteenth-century cosmopolitanism represented by Herder and Goethe up to contemporary critical debates (Apter, Casanova, Cheah, Damrosch, Dharwadker, I. Hesse, Moretti, Mufti, Pollock, Said, Spivak). World literature in relation to national literature, German-language, and Jewish literature; translation, untranslatability, the effect of markets, diaspora, politics. Literary critical readings supplemented by exemplary literary texts in multiple genres. Student contributions based on individual linguistic backgrounds. HU

LITR 445b / SPAN 302b, El Quijote en español Roberto González Echevarría

A detailed and contextualized reading of Cervantes's masterpiece conducted entirely in Spanish. The study of this iconic text familiarizes students with its literary and cultural values and Cervantes' language. Prerequisites: SPAN 140, 142, 145, or equivalent. L5,

HU TR

* **LITR 450b / FILM 445b, Film and Fiction in Interaction** Dudley Andrew

The dynamic exchange or relay between fiction and film, recognized by theorists just after WWII, while obvious in adaptations, also exists in the evolution of the styles and topics of both forms of cultural production. The French term "écriture," applied to films after 1948, is newly relevant in today's open cultural field where writers make films and where many adaptations begin as interpretations. Advanced course in literary or film studies. HU RP

* **LITR 459b / SPAN 329b, Golden Age Theater** Roberto González Echevarría

The development and apogee of the Spanish *comedia*, as well as contemporary minor subgenres such as the *auto sacramental* and the *entremés*. Exploration of how the theater synthesizes post-Garcilaso lyric, the *commedia dell'arte*, renaissance epic, the *romancero*, Spanish history, and the European renaissance literary tradition. Works by Cervantes, Lope de Vega, Tirso de Molina, Guillén de Castro, Mira de Amescua, Juan Ruiz de Alarcón, Luis Quiñones de Benavente, Pedro Calderón de la Barca, and Sor Juana Inés

de la Cruz. Comparison with English and French theater is encouraged. SPAN 140, 142, 145, or equivalent. L5, HU

* **LITR 460b / GMAN 365b, The Contemporary German Novel, 1945-2019** Rüdiger Campe

This course discusses exemplary novels in German language after 1945 from West and East Germany, Germany after Reunification, from Austria, and from Switzerland. Part I, "Zero Hour – or Not," covers political critique of Nazi Germany and the attempt of aesthetic clean break (e.g., Gunther Grass, Wolfgang Koeppen, Ingeborg Bachmann, Max Frisch); Part II "1968: Revolution or New Interiority," covers social protest versus aesthetic internationalism (e.g., Peter Handke, Christa Wolf, Hubert Fichte, Thomas Bernhard); and Part III, "The Attempt of Being Contemporary," covers German and German speaking societies in the global world (e.g., Elfriede Jelinek, Daniel Kehlmann, Yoko Tawada, Rainald Goetz). While "contemporaneity" is the particular mark of the last section, all works desire to critically intervene in their moment and their place in time. Giving an account of this desire is the goal of the course. Contextualization as needed; close reading of selected passages as the mode of work; all works are provided in English translation and German. HU

* **LITR 488a, Directed Reading and/or Individual Research** Moira Fradinger

Special projects in an area of the student's particular interest set up with the help of a faculty adviser and the director of undergraduate studies. Projects must cover material not otherwise offered by the department, must terminate in at least a term paper or its equivalent, and must have the approval of the director of undergraduate studies. Enrollment limited to Literature majors.

Senior Courses

* **LITR 491a, The Senior Essay** Moira Fradinger

An independent writing and research project. The senior essay is due in the office of the director of undergraduate studies according to the following schedule: (1) by September 6 (for LITR 491a) or January 17 (for LITR 491b), a three-page prospectus signed by the student's adviser; (2) by October 11 (for LITR 491a) or March 6 (for LITR 491b), a full rough draft (not notes); (3) by November 29 (for LITR 491a) or April 9 (for LITR 491b), the completed essay. The minimum length for an essay is twenty-five pages. Students are urged to arrange a topic and adviser early in the term before the term in which the essay is to be written.

* **LITR 492a and LITR 493a, The Yearlong Senior Essay** Moira Fradinger

An extended research project. Students must petition the curriculum committee for permission to enroll by the last day of classes in the term preceding enrollment in LITR 492. For students expecting to graduate in May, the senior essay is due in the office of the director of undergraduate studies according to the following schedule: (1) by September 6, a three-page prospectus signed by the student's adviser; (2) by February 14, a full rough draft (not notes); (3) by April 9, the completed essay. December graduates should consult the director of undergraduate studies for required deadlines. The minimum length for a yearlong senior essay is forty pages.

Mathematics

See also **Applied Mathematics**.

Director of undergraduate studies: Yifeng Liu (yifeng.liu@yale.edu), DL 410; associate director of undergraduate studies: Marketa Havlickova (miki.havlickova@yale.edu), DL 446, 432-4682; math.yale.edu

Mathematics has many aspects: it is the language and tool of the sciences, a cultural phenomenon with a rich historical tradition, and a model of abstract reasoning. The course offerings and the major in Mathematics reflect these multiple facets. The Mathematics major provides a broad education in various areas of mathematics in a program flexible enough to accommodate many ranges of interest.

PREREQUISITE

The prerequisite for both the B.A and B.S. degree programs is calculus through the level of MATH 120 or the equivalent.

PLACEMENT PROCEDURES

The department offers a three-term sequence in calculus, MATH 112, 115, and 120. Students who have not taken calculus at Yale and who wish to enroll in calculus must take the mathematics online placement examination; a link to the online examination and additional information are available on the departmental website. A calculus advising session will be held at the beginning of the fall term to answer student questions about placement.

MATH 112 is an introductory course that presupposes basic skills in high school algebra, geometry, and trigonometry. Enrolling students are expected to know the basic definitions of the trigonometric functions, synthetic division, factorization, and elementary area and volume formulas of plane and solid geometry. MATH 115 presupposes familiarity with the topics covered in MATH 112. MATH 120 presupposes familiarity with the topics covered in MATH 115.

MATH 230, 231 is an advanced course sequence in linear algebra and introductory analysis for students with exceptionally strong backgrounds in mathematics. Students who wish to enroll in MATH 230 should consult with the instructor of the course. After MATH 115, students with a strong interest in abstract mathematics should consider taking MATH 230, 231.

REQUIREMENTS OF THE MAJOR

B.A. degree program The B.A. degree program normally consists of ten term courses in Mathematics numbered 222 or higher, including MATH 480. Each student is expected to take vector calculus and linear algebra: either MATH 230 and 231, or either one of MATH 222 or 225 with MATH 250. To acquire both depth and breadth in the field, students are required to take at least two term courses in each of three of the following five categories: analysis; algebra and number theory; statistics and applied mathematics; geometry and topology; and logic and foundations.

B.S. degree program A candidate for the B.S. degree must take at least two advanced term courses in the physical sciences, such as CHEM 328, 332, 333, or PHYS 401, 402, in

addition to the ten term courses required for the B.A. Such courses require the approval of the director of undergraduate studies (DUS); written approval is advised.

Both B.A. and B.S. degree programs Each major program must also include at least one course in at least two of the three core areas: real analysis; algebra; and complex analysis. Taking courses from all three core areas is strongly recommended.

Distinction in the major To be eligible for Distinction in the Major, a student must have completed at least one course from each of the three core areas. The categories and core areas to which each course belongs are indicated in the course listings.

The intensive major Candidates for a degree with an intensive major in Mathematics must take courses in all three of the core areas: real analysis; algebra; and complex analysis. Intensive majors are also expected to include at least two graduate term courses in the Mathematics department, or equivalent independent study, in their programs. Familiarity with the material of the following courses is prerequisite to graduate courses in each category: *algebra*: two courses between 350 and 399; *analysis*: MATH 301, 305, 310; *algebraic topology*: MATH 301, 350; *logic and foundations*: MATH 270.

Substitutions With permission of the Math DUS, up to two courses from other departments may be counted towards the required courses. For a list of courses that are typically approved, visit the FAQ page on the Math department website.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

Roadmap See visual roadmap of the requirements.

SENIOR REQUIREMENT

During the senior year students majoring in Mathematics normally take the senior seminar (MATH 480). Alternatively, with the consent of the DUS, highly qualified students may write a senior essay in MATH 475 under the guidance of a faculty member, and give an oral report to the department. Students wishing to write a senior essay should consult the DUS early in the fall term.

ADVISING

Students interested in pursuing further study in pure mathematics should include MATH 301, 305, 310, 350, 370, and 430 in their programs, and should consider taking one or more graduate-level courses. Students interested in applications of mathematics should include MATH 300 or 301, 310, 350, and a selection of courses from MATH 241, 242, 244, 246, 251, 260, and CPSC 440.

Courses related to mathematics Each Mathematics major is urged to acquire additional familiarity with the uses of mathematics by taking courses in Applied Mathematics, Computer Science, Engineering and Applied Science, Economics, Philosophy, Physics, Statistics & Data Science, or other departments. In some instances a limited number of such courses may be counted among the ten courses required for the major in Mathematics, with the approval of the DUS.

Graduate work Each year the Mathematics and Statistics & Data Science departments offer a large number of graduate courses, some of which are accessible to

undergraduates with advanced preparation in mathematics. Further information may be obtained from the DUSes whose permission, with that of the relevant director of graduate studies, is required for admission.

Combined B.S./M.S. degree program Students who, by the end of their senior year, complete the requirements of the department for the M.S. in Mathematics are eligible to receive this degree at their Senior Commencement. Required are: (1) eight term courses numbered 500 or higher, most of which must be completed with grades of B or better; (2) passing a written qualifying examination of the student's choice from analysis, algebra, or topology.

The master's program is in no sense a substitute for the B.A. or B.S. program; rather, it is designed to accommodate a very few exceptional students who, by means of accelerated or independent study, can satisfy the department as to their command of the content of the normal undergraduate program by the end of the junior year. Candidates must submit a proposal that foresees this level of achievement to the DUS no later than the last day of classes in their fifth term of enrollment in Yale College. If approved by the department, the proposal is forwarded to the Yale College Dean's Office. Students' status and progress are reviewed before they are permitted to continue in the program in the senior year. For more information on Yale College requirements for the program, see Section K, Special Arrangements, "Simultaneous Award of the Bachelor's and Master's Degrees," in the Academic Regulations.

Students take at least two graduate term courses in the junior year (normally courses in algebra or analysis are the first graduate courses taken). The general oral examination covers a list of topics available from the director of graduate studies and is accepted in lieu of the usual senior oral presentation. Details concerning the requirements for the master's degree may be obtained from the director of graduate studies.

REQUIREMENTS OF THE MAJOR

Prerequisite MATH 120 or equivalent

Number of courses *B.A.* – 10 term courses numbered 222 or higher, incl MATH 480;

B.S. – same, with 2 addtl adv courses in physical sciences approved by DUS

Specific courses required *B.A. and B.S.* – MATH 230 and 231; or MATH 222 or 225 with MATH 250

Distribution of courses *B.A. and B.S.* – 2 courses in each of 3 categories chosen from: analysis; algebra and number theory; stat and applied math; geometry and topology; logic and foundations; 1 course from 2 of 3 core areas chosen from: real analysis; algebra; and complex analysis

Substitution permitted With DUS permission, up to 2 courses from other depts as specified

Intensive major Courses in all 3 core areas; 2 MATH grad courses or equivalent independent study counted among the required courses

Senior requirement Senior sem (MATH 480) or, with DUS permission, senior essay (MATH 475) and oral report

FACULTY OF THE DEPARTMENT OF MATHEMATICS

Professors Richard Beals (*Emeritus*), Jeffrey Brock, Andrew Casson (*Emeritus*), Ronald Coifman, Igor Frenkel, Howard Garland (*Emeritus*), Alexander Goncharov, Roger Howe (*Emeritus*), Peter Jones, Richard Kenyon, Yifeng Liu, Ivan Losev, Gregory

Margulis, Yair Minsky, Vincent Moncrief, Andrew Neitzke, Hee Oh, †Nicholas Read, Vladimir Rokhlin, Wilhelm Schlag, George Seligman (*Emeritus*), †Daniel Spielman, Van Vu, †John S. Wettlaufer, Gregg Zuckerman

Assistant Professor Stefan Steinerberger

J. W. Gibbs Assistant Professors Ross Berkowitz, Pat Devlin, Jeremy Hoskins, Ariel Jaffe, Arie Levit, Ofir Lindenbaum, Yuchen Liu, Kalina Mincheva, Gal Mishne, Fei Qi, Kirill Serkh, Oleksandr Tsymbaliuk, Caglar Uyanik, Tom VandenBoom, Anibal Velozo, Philsang Yoo

Adjunct Professors Gil Kalai, Alex Lubotzky, Mathias Schacht

Senior Lecturers John Hall, Marketa Havlickova

Lecturers Ian Adelstein, Asher Auel, Sudesh Kalyanswamy, Itziar Ochoa de Alaiza Gracia, Erik Rosenthal, Pam Sargent, Brett Smith, Sarah Vigliotta

†A joint appointment with primary affiliation in another department.

Courses

MATH 106b, The Shape of Space Ian Adelstein

This course provides an introduction to mathematical thinking through ideas in geometry and graph theory. Traditional lecture, worksheets, discussion, group work, and classroom activities all contribute to a dynamic learning experience. The course follows a historical narrative, starting from antiquity, to understand the foundations of mathematical thought. An axiomatic approach to geometry affords students the opportunity to construct proofs of classical theorems. The basics of graph theory are introduced in order to explore real world problems such as map coloring and bridge crossing. The ancient Greek method of exhaustion previews a discussion of the integral, and from here we explore the beautiful relationship between the geometry and topology of graphs, polyhedra, and surfaces. Throughout the course students build their mathematical and geometric intuition through problem solving and exercises in geometric imagining. Enrollment is limited to students who have not previously taken a course numbered at or above MATH 110. QR

* **MATH 107a, Mathematics in the Real World** Brett Smith

The use of mathematics to address real-world problems. Applications of exponential functions to compound interest and population growth; geometric series in mortgage payments, amortization of loans, present value of money, and drug doses and blood levels; basic probability, Bayes's rule, and false positives in drug testing; elements of logic. No knowledge of calculus required. Enrollment limited to students who have not previously taken a high school or college calculus course. QR

MATH 108b, Estimation and Error Sudesh Kalyanswamy

A problem-based investigation of basic mathematical principles and techniques that help make sense of the world. Estimation, order of magnitude, approximation and error, counting, units, scaling, measurement, variation, simple modeling. Applications to demographics, geology, ecology, finance, and other fields. Emphasis on both the practical and the philosophical implications of the mathematics. No knowledge of calculus required. Enrollment limited to students who have not previously taken a high school or college calculus course. QR

* **MATH 110a, Introduction to Functions and Calculus I** Staff

Comprehensive review of precalculus, limits, differentiation and the evaluation of definite integrals, with applications. Precalculus and calculus topics are integrated. Emphasis on conceptual understanding and problem solving. Successful completion of MATH 110 and 111 is equivalent to MATH 112. No prior acquaintance with calculus is assumed; some knowledge of algebra and precalculus mathematics is helpful. QR

* **MATH 111b, Introduction to Functions and Calculus II** Staff

Continuation of MATH 110. Comprehensive review of precalculus, limits, differentiation and evaluation of definite integrals, with applications. Precalculus and calculus topics are integrated. Emphasis on conceptual understanding and problem solving. Successful completion of both MATH 110 and 111 is equivalent to MATH 112. Prerequisite: MATH 110. QR

* **MATH 112a or b, Calculus of Functions of One Variable I** Staff

Limits and their properties. Definitions and some techniques of differentiation and the evaluation of definite integrals, with applications. Use of the software package Mathematica to illustrate concepts. No prior acquaintance with calculus or computing assumed. May not be taken after MATH 110 or 111. QR

* **MATH 115a or b, Calculus of Functions of One Variable II** Staff

A continuation of MATH 112. Applications of integration, with some formal techniques and numerical methods. Improper integrals, approximation of functions by polynomials, infinite series. Exercises involve the software package Mathematica. After MATH 112 or equivalent; open to freshmen with some preparation in calculus. May not be taken after MATH 116. QR

* **MATH 116a, Mathematical Models in the Biosciences I: Calculus Techniques** John Hall

Introduction to topics in mathematical modeling that are applicable to biological systems. Discrete and continuous models of population, neural, and cardiac dynamics. Stability of fixed points and limit cycles of differential equations. Applications include Norton's chemotherapy scheduling and stochastic models of tumor suppressor gene networks. After MATH 112 or equivalent. May not be taken after MATH 115. QR

* **MATH 118a or b, Introduction to Functions of Several Variables** Staff

A combination of linear algebra and differential calculus of several variables. Matrix representation of linear equations, Gauss elimination, vector spaces, independence, basis and dimension, projections, least squares approximation, and orthogonality. Three-dimensional geometry, functions of two and three variables, level curves and surfaces, partial derivatives, maxima and minima, and optimization. Intended for students in the social sciences, especially Economics. May not be taken after MATH 120 or 222. Prerequisite: MATH 112. QR

* **MATH 120a or b, Calculus of Functions of Several Variables** Staff

Analytic geometry in three dimensions, using vectors. Real-valued functions of two and three variables, partial derivatives, gradient and directional derivatives, level curves and surfaces, maxima and minima. Parametrized curves in space, motion in space, line integrals; applications. Multiple integrals, with applications. Divergence and curl. The theorems of Green, Stokes, and Gauss. After MATH 115, or with permission of instructor. May not be taken after MATH 121. QR

*** MATH 121b, Mathematical Models in the Biosciences II: Advanced Techniques**

John Hall

A continuation of MATH 116, focusing on epidemiological models, mathematical foundations of virus and antiviral dynamics, ion channel models and cardiac arrhythmias, and evolutionary models of disease.

After MATH 116, or with permission of instructor. QR

MATH 160b / AMTH 160b / S&DS 160b, The Structure of Networks

Ronald Coifman

Network structures and network dynamics described through examples and applications ranging from marketing to epidemics and the world climate. Study of social and biological networks as well as networks in the humanities. Mathematical graphs provide a simple common language to describe the variety of networks and their properties. QR

MATH 222a or b / AMTH 222a or b, Linear Algebra with Applications

Staff

Matrix representation of linear equations. Gauss elimination. Vector spaces. Linear independence, basis, and dimension. Orthogonality, projection, least squares approximation; orthogonalization and orthogonal bases. Extension to function spaces. Determinants. Eigenvalues and eigenvectors. Diagonalization. Difference equations and matrix differential equations. Symmetric and Hermitian matrices. Orthogonal and unitary transformations; similarity transformations. After MATH 115 or equivalent.

May not be taken after MATH 225. QR

MATH 225a or b, Linear Algebra and Matrix Theory

Staff

An introduction to the theory of vector spaces, matrix theory and linear transformations, determinants, eigenvalues, and quadratic forms. Some relations to calculus and geometry are included. After or concurrently with MATH 120. May not be taken after MATH 222. QR

*** MATH 230a, Vector Calculus and Linear Algebra I**

Patrick Devlin

A careful study of the calculus of functions of several variables, combined with linear algebra. QR

*** MATH 231b, Vector Calculus and Linear Algebra II**

Patrick Devlin

Continuation of MATH 230. Application of linear algebra to differential calculus. Inverse and implicit function theorems; the idea of a manifold; integration of differential forms; general Stokes' theorem. QR

*** MATH 235b, Reflection Groups**

Caglar Uyanik

Concepts of linear algebra are used to explore the algebraic and geometric properties of groups generated by reflections. Examples from reflection groups introduce elements of group theory, Lie algebras, and representation theory. Reflections in a real Euclidean space, groups generated by reflections, crystallographic groups, and Coxeter groups. Preference to sophomores majoring in mathematics or the sciences. Prerequisite:

MATH 222 or 225. QR

MATH 240b, Advanced Linear Algebra

Stefan Steinerberger

The course is designed to continue discussing various aspects of linear algebra starting at eigenvalues. Materials covered include generalized eigenvalues, the Jordan block decomposition, the Moore-Penrose pseudoinverse, singular values, and the basics of

perturbation theory. Other material may be discussed at the instructor's discretion. After MATH 225 or MATH 230/231.

MATH 241a / S&DS 241a, Probability Theory Winston Lin

Introduction to probability theory. Topics include probability spaces, random variables, expectations and probabilities, conditional probability, independence, discrete and continuous distributions, central limit theorem, Markov chains, and probabilistic modeling. After or concurrently with MATH 120 or equivalent. QR

MATH 242b / S&DS 242b, Theory of Statistics Andrew Barron

Study of the principles of statistical analysis. Topics include maximum likelihood, sampling distributions, estimation, confidence intervals, tests of significance, regression, analysis of variance, and the method of least squares. Some statistical computing. After S&DS 241 and concurrently with or after MATH 222 or 225, or equivalents. QR

MATH 244a or b / AMTH 244a or b, Discrete Mathematics Staff

Basic concepts and results in discrete mathematics: graphs, trees, connectivity, Ramsey theorem, enumeration, binomial coefficients, Stirling numbers. Properties of finite set systems. Recommended preparation: MATH 115 or equivalent. QR

MATH 246a or b, Ordinary Differential Equations Staff

First-order equations, second-order equations, linear systems with constant coefficients. Numerical solution methods. Geometric and algebraic properties of differential equations. After MATH 120 or equivalent; after or concurrently with MATH 222 or 225 or equivalent. QR

MATH 250a or b, Vector Analysis Staff

Calculus of functions of several variables, using vector and matrix methods. The derivative as a linear mapping. Inverse and implicit function theorems. Transformation of multiple integrals. Line and surface integrals of vector fields. Curl and divergence. Differential forms. Theorems of Green and Gauss; general Stokes' theorem. After MATH 120, and 222 or 225 or equivalent. QR

MATH 251b / EENG 434b / S&DS 351b, Stochastic Processes Amin Karbasi

Introduction to the study of random processes including linear prediction and Kalman filtering, Poisson counting process and renewal processes, Markov chains, branching processes, birth-death processes, Markov random fields, martingales, and random walks. Applications chosen from communications, networking, image reconstruction, Bayesian statistics, finance, probabilistic analysis of algorithms, and genetics and evolution. Prerequisite: S&DS 241 or equivalent. QR

MATH 270a, Set Theory Gregg Zuckerman

Algebra of sets; finite, countable, and uncountable sets. Cardinal numbers and cardinal arithmetic. Order types and ordinal numbers. The axiom of choice and the well-ordering theorem. After MATH 120 or equivalent. QR

MATH 300b, Topics in Analysis Staff

An introduction to analysis, with topics chosen from infinite series, the theory of metric spaces, and fixed-point theorems with applications. Students who have taken MATH 230, 231 should take MATH 301 instead of this course. After MATH 250 or with permission of instructor. QR

* **MATH 301a, Introduction to Analysis** Peter Jones

Foundations of real analysis, including metric spaces and point set topology, infinite series, and function spaces. After MATH 230, 231 or equivalent. QR

MATH 305b, Real Analysis Hee Oh

The Lebesgue integral, Fourier series, applications to differential equations. After MATH 301 or with permission of instructor. QR

MATH 310a, Introduction to Complex Analysis Franco Vargas Pallete

An introduction to the theory and applications of functions of a complex variable. Differentiability of complex functions. Complex integration and Cauchy's theorem. Series expansions. Calculus of residues. Conformal mapping. After MATH 231 or 250 or equivalent. QR

* **MATH 315b, Intermediate Complex Analysis** Franco Vargas Pallete

Continuation of MATH 310. Topics may include argument principle, Rouché's theorem, Hurwitz theorem, Runge's theorem, analytic continuation, Schwarz reflection principle, Jensen's formula, infinite products, Weierstrass theorem. Functions of finite order, Hadamard's theorem, meromorphic functions. Mittag-Leffler's theorem, subharmonic functions. After MATH 310. QR RP

* **MATH 320a, Measure Theory and Integration** Arie Levit

Construction and limit theorems for measures and integrals on general spaces; product measures; L_p spaces; integral representation of linear functionals. After MATH 305 or equivalent. QR RP

* **MATH 325b, Introduction to Functional Analysis** Jeremy Hoskins

Hilbert, normed, and Banach spaces; geometry of Hilbert space, Riesz-Fischer theorem; dual space; Hahn-Banach theorem; Riesz representation theorems; linear operators; Baire category theorem; uniform boundedness, open mapping, and closed graph theorems. After MATH 320. QR RP

MATH 330b / S&DS 400b, Advanced Probability Sekhar Tatikonda

Measure theoretic probability, conditioning, laws of large numbers, convergence in distribution, characteristic functions, central limit theorems, martingales. Some knowledge of real analysis assumed. QR

* **MATH 345a, Modern Combinatorics** Mathias Schacht

Recent developments and important questions in combinatorics. Relations to other areas of mathematics such as analysis, probability, and number theory. Topics include probabilistic method, random graphs, random matrices, pseudorandomness in graph theory and number theory, Szemerédi's theorem and lemma, and Green-Tao's theorem. Prerequisite: MATH 244. QR

MATH 350a, Introduction to Abstract Algebra Marketa Havlickova

Group theory, structure of Abelian groups, and applications to number theory. Symmetric groups and linear groups including orthogonal and unitary groups; properties of Euclidean and Hermitian spaces. Some examples of group representations. Modules over Euclidean rings, Jordan and rational canonical forms of a linear transformation. After MATH 225, 231, or 222, with additional experience writing mathematical proofs. QR

*** MATH 354b, Number Theory** Rong Zhou

Prime numbers; quadratic reciprocity law, Gauss sums; finite fields, equations over finite fields; zeta functions. After MATH 350. QR

MATH 360b, Introduction to Lie Groups PhilSang Yoo

Lie groups as the embodiment of the idea of continuous symmetry. The exponential map on matrices and applications; spectral theory; examples and structure of Lie groups and Lie algebras; connections with geometry and physics. After MATH 350, 231, or 250. MATH 300 or 301 recommended. QR

MATH 370b, Fields and Galois Theory Richard Kenyon

Rings, with emphasis on integral domains and polynomial rings. The theory of fields and Galois theory, including finite fields, solvability of equations by radicals, and the fundamental theorem of algebra. Quadratic forms. After MATH 350. QR

MATH 380a, Modern Algebra I Staff

A survey of algebraic constructions and theories at a sophisticated level. Topics include categorical language, free groups and other free objects in categories, general theory of rings and modules, artinian rings, and introduction to homological algebra. After MATH 350 and 370. QR RP

MATH 381b, Modern Algebra II Kalina Mincheva

This course is the noncommutative counterpart to MATH 380. Abstract and concrete groups, rings and fields play a fundamental role. The main new concept is the notion of a left (right) module over a possibly noncommutative ring. The category $R\text{-mod}$ of all left modules over a ring R encodes important information about the isomorphism class of R . After MATH 380. QR RP

MATH 421a / AMTH 420a, The Mathematics of Data Science Stefan Steinerberger

This course aims to be an introduction to the mathematical background that underlies modern data science. The emphasis is on the mathematics but occasional applications are discussed (in particular, no programming skills are required). Covered material may include (but is not limited to) a rigorous treatment of tail bounds in probability, concentration inequalities, the Johnson-Lindenstrauss Lemma as well as fundamentals of random matrices, and spectral graph theory. Prerequisite: MATH 305. QR, SC

MATH 430a, Introduction to Algebraic Topology Caglar Uyanik

The theory of fundamental groups and covering spaces, with particular reference to two-dimensional manifolds. After MATH 350, and 300 or 301, or equivalents. QR

MATH 435b, Differential Geometry Vincent Moncrief

Applications of calculus to the study of the geometry of curves and surfaces in Euclidean space, intrinsic differential geometric properties of manifolds, and connections with non-Euclidean geometries and topology. After MATH 231 or 250 or equivalent. QR

MATH 447a / AMTH 247a / G&G 247a / MATH 247, Partial Differential Equations

Wilhelm Schlag

Introduction to partial differential equations, wave equation, Laplace's equation, heat equation, method of characteristics, calculus of variations, series and transform methods, and numerical methods. Prerequisites: MATH 305, or equivalents.

MATH 470a or b, Individual Studies Staff

Individual investigation of an area of mathematics outside of those covered in regular courses, involving directed reading, discussion, and either papers or an examination. A written plan of study approved by the student's adviser and the director of undergraduate studies is required. The course may normally be elected for only one term.

MATH 475a or b, Senior Essay Staff

Highly qualified students may write a senior essay under the guidance of a faculty member, and give an oral report to the department. Students wishing to write a senior essay should consult the director of undergraduate studies early in the fall term.

*** MATH 480a or b, Senior Seminar: Mathematical Topics** Staff

A number of mathematical topics are chosen each term—e.g., differential topology, Lie algebras, mathematical methods in physics—and explored in one section of the seminar. Students present several talks on the chosen topic. One section each year is devoted to topics of interest to Economics and Mathematics majors, and is co-taught by a member of the Economics department.

OTHER COURSES RELATED TO MATHEMATICS

CPSC 365b / ECON 365b, Algorithms James Glenn

Paradigms for algorithmic problem solving: greedy algorithms, divide and conquer, dynamic programming, and network flow. NP completeness and approximation algorithms for NP-complete problems. Algorithms for problems from economics, scheduling, network design and navigation, geometry, biology, and optimization. Provides algorithmic background essential to further study of computer science. Either CPSC 365 or CPSC 366 may be taken for credit. Prerequisites: CPSC 202 and 223. QR

PHIL 267b, Mathematical Logic Sun-Joo Shin

An introduction to the metatheory of first-order logic, up to and including the completeness theorem for the first-order calculus. Introduction to the basic concepts of set theory. Prerequisite: PHIL 115 or permission of instructor. QR

*** PHIL 427b, Computability and Logic** Sun-Joo Shin

A technical exposition of Gödel's first and second incompleteness theorems and of some of their consequences in proof theory and model theory, such as Löb's theorem, Tarski's undefinability of truth, provability logic, and nonstandard models of arithmetic. Prerequisite: PHIL 267 or permission of instructor. QR, HU

Mathematics and Philosophy

Directors of undergraduate studies: Yifeng Liu (yifeng.liu@yale.edu) (Mathematics), DL 410; associate director of undergraduate studies: Marketa Havlickova (miki.havlickova@yale.edu) (Mathematics), DL 446, 432-4682; Daniel Greco (daniel.greco@yale.edu) (Philosophy), 106A C, 432-1687

The Mathematics and Philosophy major allows students to explore those areas where philosophy and mathematics meet, in particular, mathematical and philosophical logic and the philosophy of mathematics.

PREREQUISITE

The prerequisite for the major is MATH 120.

REQUIREMENTS OF THE MAJOR

The major requires twelve term courses including the prerequisite and the senior seminar. Of the remaining courses, at least four must be in mathematics at the 200 level or higher and five must be in philosophy. All philosophy courses are eligible for credit toward the major, with the exception of First-Order Logic (PHIL 115). Required courses include Set Theory (MATH 270), Mathematical Logic (PHIL 267), Computability and Logic (PHIL 427), an additional advanced philosophy course with a substantive logical component, and one seminar in either mathematics or philosophy (other than PHIL 427) that fulfills the senior requirement (see below). Set Theory (MATH 270) and Mathematical Logic (PHIL 267) must be taken before the end of the junior year; it is strongly recommended that they be taken earlier.

A course must be listed with a MATH number to count toward the mathematics requirements—substitutions from other departments are not allowed.

SENIOR REQUIREMENT

Each year certain seminars offered by the Mathematics and Philosophy departments are designated as fulfilling the senior requirement of the combined major. If such a seminar is taken in order to fulfill the senior requirement, majors must consult with the instructor and agree upon additional work required. Typically, additional work includes a substantial class presentation and/or preparation of a series of drafts prior to submission of the final paper.

The mathematics seminar MATH 480, Senior Seminar: Mathematical Topics, fulfills the senior requirement. For philosophy seminars that fulfill the senior requirement, consult the director of undergraduate studies (DUS) in Philosophy.

ADVISING

A typical program satisfying the major might consist of MATH 120, 222 or 225, 270, 300, 350, and a designated seminar; PHIL 126, 267, 427, a designated seminar (other than PHIL 427), and two additional electives.

REQUIREMENTS OF THE MAJOR

Prerequisite MATH 120

Number of courses 12 term courses (incl prereq and senior sem)

Specific courses required MATH 270, PHIL 267, 427

Distribution of courses At least 4 courses in Math at 200 level or higher; at least 5 courses in Phil, as specified

Senior requirement Senior sem

Mathematics and Physics

Adviser for the major: Vincent Moncrief (vincent.moncrief@yale.edu), 64 SPL, 432-6930

The major in Mathematics and Physics allows students to explore the productive interaction between the two subjects more extensively than either individual major.

PREREQUISITES

Prerequisites to the major include MATH 120 or its equivalent, an introductory physics lecture sequence numbered PHYS 180, 181 or above, and the associated laboratory sequence PHYS 205L, 206L.

REQUIREMENTS OF THE MAJOR

Beyond the prerequisites, the major requires a minimum of fourteen term courses above the introductory level, including the senior project. At least six of these must be Mathematics courses numbered 222 or above, and at least six must be advanced Physics courses chosen in consultation with the adviser for the major.

A course must be listed with a Math number to count toward the mathematics requirements – substitutions from other departments are not allowed.

SENIOR REQUIREMENT

A senior project in PHYS 471 or 472 on a topic appropriate for the combined major and acceptable to both the Physics and the Mathematics departments is also required. The student must present an oral report on this project to the Mathematics department.

REQUIREMENTS OF THE MAJOR

Prerequisites MATH 120 or equivalent; PHYS 180, 181, or 200, 201, or 260, 261; PHYS 205L, 206L

Number of courses 14 term courses beyond prereqs, incl senior req

Distribution of courses 6 Math courses numbered 222 or above; 6 advanced Physics courses selected in consultation with major adviser

Senior requirement Senior project in PHYS 471 or 472 on topic acceptable to both depts; oral report on project to Math dept

Mechanical Engineering

Director of undergraduate studies: Corey O'Hern (corey.ohern@yale.edu), M203 ML, 432-4258; seas.yale.edu/departments/mechanical-engineering-and-materials-science

Mechanical engineering is among the most diversified of the traditional engineering disciplines. The mechanical engineer builds machines to extend our physical and mental capabilities and to convert traditional and novel energy sources into useful forms.

The role of the mechanical engineer has changed dramatically over the past few decades with the extensive use of high-performance computers (in such areas as computational fluid dynamics, materials design, control, and manufacturing), the interfacing of microelectromechanical systems and actuators via microprocessors to build high-precision sensors and devices, and the advent of advanced materials (e.g., composites, shape-memory alloys, ceramics, and superconductors) for new applications (e.g., coatings, biomaterials, and computer storage). These areas offer mechanical engineering students special opportunities for creativity, demanding that they learn not only in depth but also in breadth. Demands for increased energy efficiency and reduced environmental impact—as might be realized, for example, in novel gas turbine or electric hybrid vehicles—require that students understand the fundamentals of mechanics, thermodynamics, fluid mechanics, combustion, and materials science. In all these tasks, the utmost consideration of the modern mechanical engineer is improving the quality of human life. The engineer must also be constantly aware both of the finiteness of Earth's resources and its environment and of the burden that engineering places on them.

The educational mission of the Department of Mechanical Engineering and Materials Science is to provide an excellent education that will prepare students to become members of the next generation of mechanical engineers. To implement this mission, the department adheres to the following set of educational objectives: to provide a balanced technical and nontechnical education to enable graduates to enter highly selective graduate schools and/or to pursue technical careers in industry or government laboratories; to enable graduates to improve and adapt their skills to accommodate rapid technological changes; to prepare graduates to communicate effectively and to understand the ethical responsibilities and impact on society of their profession. To achieve these objectives, the following fundamental educational goals have been established for the Department of Mechanical Engineering and Materials Science: to provide a comprehensive introduction to basic science and mathematics, which form the foundation of mechanical engineering; to provide thorough training in analytical and experimental methods and in data analysis, including problem formulation; to provide instruction in the fundamentals of the design process, including project innovation, synthesis, and management, both individually and in a team setting; to provide both a technical and a nontechnical program of study in which oral and written communication skills are developed; and to instill in students an understanding of their professional and ethical responsibilities, which affect society and their profession.

COURSES FOR NONMAJORS

Mechanics and mechanical engineering content can be found in several courses intended for those not majoring in science. See Engineering and Applied Science.

THE MECHANICAL ENGINEERING PROGRAM

At Yale, three mechanical engineering programs are offered: a B.S. degree program with a major in Mechanical Engineering, a B.S. degree program with a major in Engineering Sciences (Mechanical), and a B.A. degree program with a major in Engineering Sciences (Mechanical). Prospective majors in both B.S. programs are advised to complete introductory physics and mathematics through calculus (MATH 115) by the end of their first year.

A student's undergraduate engineering program may include one or more special project courses (MENG 471, 472, 473, or 474), in which the student pursues a particular research interest through design-oriented projects and experimental investigations. Projects may be initiated by the student, may be performed in a team, or may be derived from the ideas of faculty members who place undergraduates in their ongoing research projects. All interested students should contact the director of undergraduate studies (DUS) for more information on special project courses.

B.S. degree program in Mechanical Engineering This is the most technically intensive mechanical engineering degree program and is accredited by the Engineering Accreditation Commission of ABET, Inc. This program is appropriate for students who plan careers as practicing engineers in industry, consulting firms, or government as well as for students who are considering a career in research and plan to pursue an advanced degree in engineering.

B.S. degree program in Engineering Sciences (Mechanical) This non-ABET degree program is suitable for students who wish to gain significant expertise within mechanical engineering while combining their engineering studies with related disciplines. For example, a number of students have taken courses in architecture while pursuing a program in mechanical engineering that emphasizes structural mechanics; similarly, a student with an interest in computer graphics might combine engineering courses in computer-aided design with programming courses from the Department of Computer Science.

B.A. degree program in Engineering Sciences (Mechanical) In a society with increasing levels of technical sophistication, a well-rounded individual must have some background in science and technology. The non-ABET B.A. program is designed for students who may be planning careers in business, law, economics, medicine, journalism, or politics but need to understand the impact that science and technology can have on society at large. An understanding of engineering methods and practices, combined with a traditional liberal arts education, provides a strong background for a variety of careers. The program is well suited for students who wish to fulfill the requirements of two majors.

The major for all three degree programs requires a group of prerequisites or equivalents; several courses beyond the prerequisites; and a senior requirement, as indicated below.

PREREQUISITES

B.S. degree program in Mechanical Engineering The prerequisites in mathematics are MATH 112, 115, and ENAS 151, or the equivalent. The basic science prerequisites are PHYS 180, 181, or 200, 201; one laboratory from PHYS 165L or 205L, and one from PHYS 166L or 206L, or equivalents.

B.S. degree program in Engineering Sciences (Mechanical) The prerequisites in mathematics are MATH 112, 115, and ENAS 151, or the equivalent. The basic science prerequisites are PHYS 180, 181, or 200, 201; one laboratory from PHYS 165L or 205L, and one from PHYS 166L, 206L, or MENG 286L.

B.A. degree program in Engineering Sciences (Mechanical) The prerequisites in mathematics are MATH 112 and 115. The basic science prerequisite is physics at least to the level of PHYS 170, 171.

REQUIREMENTS OF THE MAJOR

B.S. degree program in Mechanical Engineering

The major for the Class of 2020 With DUS approval, the following changes to the requirements of the major may be fulfilled by students who declared their major under previous requirements.

The major for the Class of 2021 and subsequent classes requires 21 courses and 19.5 credits beyond the prerequisites as follows:

1. Advanced mathematics: ENAS 194 and MATH 222 or 225
2. Mechanical engineering and related: MENG 185, 211, 280, 285, 286L, MENG 325, 361, 363L, 383, 389, 390, MENG 487L and MENG 488L (the senior requirement), ENAS 130, EENG 200, and at least one lecture course in chemistry numbered CHEM 161 or higher
3. Technical electives: three approved technical electives chosen in consultation with the DUS; only one course from MENG 471, 472, 473, and 474 may be counted as one of the three technical electives

The curriculum in this program is arranged in prescribed patterns, but some departures from it are possible with approval of the DUS.

B.S. degree program in Engineering Sciences (Mechanical) The major requires twelve approved term courses in engineering, beyond the prerequisites and including the senior project, which can cover a broad array of topics within the subject provided that they contribute to a coherent program. Students should consult with the DUS at the beginning of their sophomore year.

B.A. degree program in Engineering Sciences (Mechanical) The program requires eight approved term courses beyond the prerequisites, including the senior project. Students should consult with the DUS at the beginning of their sophomore year.

Credit/D/Fail No courses taken Credit/D/Fail may be counted toward the Mechanical Engineering major, including prerequisites.

Roadmap See visual roadmap of the requirements.

SENIOR REQUIREMENT

B.S. degree program in Mechanical Engineering

The major for the Class of 2020 With DUS approval, the following change to the senior requirement may be fulfilled by students who declared their major under previous requirements.

The major for the Class of 2021 and subsequent classes MENG 487L (half-credit) and MENG 488L (half-credit) taken in the senior year fulfill the senior requirement.

B.S. degree program in Engineering Sciences (Mechanical) Students satisfy the senior project requirement by completing MENG 404; 471, 472, 473, or 474; 487L and 488L; 489; or another upper-level design course (taken during the senior year) chosen in consultation with the DUS.

B.A. degree program in Engineering Sciences (Mechanical) Students satisfy the senior project requirement by completing MENG 471, 472, 473, or 474; or another upper-level design course (taken during their senior year) chosen in consultation with the DUS.

REQUIREMENTS OF THE MAJOR

MECHANICAL ENGINEERING, B.S.

Prerequisites MATH 112, 115, and ENAS 151, or equivalent; PHYS 180, 181, or 200, 201, and 2 labs (1 from PHYS 165L or 205L, and 1 from PHYS 166L or 206L, or equivalents)

Number of courses 21 term courses beyond prerequisites (including senior req)

Specific courses required ENAS 130 and 194; EENG 200; MATH 222 or 225; MENG 185, 211, 280, 285, 286L, MENG 325, 361, 363L, 383, 389, 390

Distribution of courses 3 technical electives chosen in consultation with DUS (only one of MENG 471, 472, 473, or 474); 1 term course in chemistry numbered CHEM 161 or higher

Substitution permitted With DUS approval

Senior requirement MENG 487L and MENG 488L taken in senior year

ENGINEERING SCIENCES (MECHANICAL), B.S.

Prerequisites MATH 112, 115, and ENAS 151, or equivalent; PHYS 180, 181, or 200, 201, and 2 labs (1 from PHYS 165L or 205L; 1 from PHYS 166L, 206L, or MENG 286L)

Number of courses 12 term courses beyond prerequisites (incl senior req)

Substitution permitted With DUS approval

Senior requirement MENG 404; 471, 472, 473, or 474; 487L and 488L; 489; or another upper-level design course chosen in consultation with the DUS

ENGINEERING SCIENCES (MECHANICAL), B.A.

Prerequisites MATH 112, 115; PHYS 170, 171 or higher

Number of courses 8 term courses beyond prerequisites (incl senior req)

Substitution permitted With DUS approval

Senior requirement MENG 471, 472, 473, or 474; or another upper-level design course chosen in consultation with the DUS

FACULTY OF THE DEPARTMENT OF MECHANICAL ENGINEERING AND MATERIALS SCIENCE

Professors Charles Ahn, Ira Bernstein (*Emeritus*), Aaron Dollar, Juan Fernández de la Mora, Alessandro Gomez, †Sohrab Ismail-Beigi, †Shun-Ichiro Karato, Marshall Long, Corey O'Hern, Brian Scassellati, Jan Schroers, Udo Schwarz (*Chair*), Mitchell Smooke

Associate Professor Judy Cha

Assistant Professors Eric Brown, Rebecca Kramer-Bottiglio, Diana Qiu, Madhusudhan Venkadesan

Lecturers Beth Anne Bennett, Joseph Zinter

†A joint appointment with primary affiliation in another department or school.

Courses

MENG 185a or b, Mechanical Design Staff

A course designed for potential majors in mechanical engineering, with units on design methodology, statics, mechanics of materials, and machining. Includes a design project. Prerequisite: physics at the level of PHYS 180, or permission of instructor. SC

MENG 211b, Thermodynamics for Mechanical Engineers Staff

Study of energy and its transformation and utilization. First and Second Laws for closed and open systems, equations of state, multicomponent nonreacting systems, auxiliary functions (H, A, G), and the chemical potential and conditions of equilibrium. Engineering devices such as power and refrigeration systems and their efficiencies. Prerequisites: PHYS 180 or 200, and MATH 115. QR, SC RP

MENG 280a, Mechanical Engineering I: Strength and Deformation of Mechanical Elements Eric Brown

Elements of statics; mechanical behavior of materials; equilibrium equations, strains and displacements, and stress-strain relations. Elementary applications to trusses, bending of beams, pressure vessels, and torsion of bars. Prerequisites: PHYS 180 or 200, and MATH 115. QR, SC RP

MENG 285a, Introduction to Materials Science Sudhangshu Bose

Study of the atomic and microscopic origin of the properties of engineering materials: metals, glasses, polymers, ceramics, and composites. Phase diagrams; diffusion; rates of reaction; mechanisms of deformation, fracture, and strengthening; thermal and electrical conduction. Prerequisites: elementary calculus and background in basic mechanics (deformation, Hooke's law) and structure of atoms (orbitals, periodic table). QR, SC RP

MENG 286La or b, Solid Mechanics and Materials Science Laboratory Staff

Experiments that involve either structural mechanics or materials science. Comparisons between structural theories and experimental results. Relationships among processing, microstructure, and properties in materials science. Introduction to techniques for the examination of the structure of materials. SC RP ½ Course cr

* **MENG 325b, Machine Elements and Manufacturing Processes** Joran Booth

This course provides students a working knowledge of two fundamental topics related to mechanical design: machine elements and manufacturing processes. *Machine*

elements refer one or more of a range of common design elements that transmit power and enable smooth and efficient motion in mechanical systems with moving parts. This course introduces the most common of these elements and gives students the tools to systems design with them. Topics include common linkages, gearing, bearings, springs, clutches, brakes, and common actuators such as DC motors. *Manufacturing processes* are necessary for the mechanical design engineer to effectively perform her or his duties; they provide an understanding of how the parts and systems that they design are fabricated, allowing “Design for Manufacturing” principles to be taken into account in the product development process. Students learn the basics of common commercial manufacturing processes for mechanical systems, including low-volume processes such as machining to high-volume processes such as casting (metal parts), molding (plastic parts), and stamping (sheet metal parts). Prerequisites: Extensive CAD experience. MENG 185 and MENG 280 recommended.

MENG 361a, Mechanical Engineering II: Fluid Mechanics Alessandro Gomez
Mechanical properties of fluids, kinematics, Navier-Stokes equations, boundary conditions, hydrostatics, Euler's equations, Bernoulli's equation and applications, momentum theorems and control volume analysis, dimensional analysis and similitude, pipe flow, turbulence, concepts from boundary layer theory, elements of potential flow. Prerequisites: ENAS 194 or equivalent, and physics at least at the level of PHYS 180.
QR, SC RP

* **MENG 363Lb, Fluid Mechanics and Thermodynamics Laboratory** Staff
Hands-on experience in applying the principles of fluid mechanics and thermodynamics. Integration of experiment, theory, and simulation to reflect real-world phenomena. Students design and test prototype devices. Prerequisites: MENG 211 and 361. WR, SC RP

MENG 365b, Chemical Propulsion Systems Ronald Lehrach
Study of chemical propulsion systems. Topics include review of propulsion fundamentals; concepts of compressible fluid flow; development and application of relations for Fanno and Rayleigh flows; normal and oblique shock systems to various propulsion system components; engine performance characteristics; fundamentals of turbomachinery; liquid and solid rocket system components and performance. MENG 361 or permission of instructor. QR, SC RP

MENG 383a, Mechanical Engineering III: Dynamics Alex Tsai
Kinematics and dynamics of particles and systems of particles. Relative motion; systems with constraints. Rigid body mechanics; gyroscopes. Prerequisites: PHYS 180 or 200, and MATH 120 or ENAS 151. QR, SC RP

MENG 389b, Mechanical Engineering IV: Fluid and Thermal Energy Science Staff
Fundamentals of mechanical engineering applicable to the calculation of energy and power requirements, as well as transport of heat by conduction, convection, and radiation. Prerequisites: MENG 211, 361, and ENAS 194; or permission of instructor.
QR, SC RP

MENG 390b, Mechatronics Laboratory Madhusudhan Venkadesan
Hands-on synthesis of control systems, electrical engineering, and mechanical engineering. Review of Laplace transforms, transfer functions, software tools for solving ODEs. Review of electronic components and introduction to electronic instrumentation. Introduction to sensors; mechanical power transmission

elements; programming microcontrollers; PID control. Prerequisites: ENAS 194 or equivalent, ENAS 130, and EENG 200; or permission of instructor. QR RP

MENG 400a or b, Computer-Aided Engineering Staff

Aspects of computer-aided design and manufacture (CAD/CAM). The computer's role in the mechanical design and manufacturing process; commercial tools for two- and three-dimensional drafting and assembly modeling; finite-element analysis software for modeling mechanical, thermal, and fluid systems. Prerequisite: ENAS 130 or permission of instructor. QR

MENG 404b / BENG 404b, Medical Device Design and Innovation Daniel Wiznia and Steven Tommasini

The engineering design, project planning, prototype creation, and fabrication processes for medical devices that improve patient conditions, experiences, and outcomes. Students develop viable solutions and professional-level working prototypes to address clinical needs identified by practicing physicians. Some attention to topics such as intellectual property, the history of medical devices, documentation and reporting, and regulatory affairs.

MENG 441a / ENAS 441a, Applied Numerical Methods for Differential Equations

Beth Anne Bennett

The derivation, analysis, and implementation of numerical methods for the solution of ordinary and partial differential equations, both linear and nonlinear. Additional topics such as computational cost, error estimation, and stability analysis are studied in several contexts throughout the course. Prerequisites: MATH 115, and 222 or 225, or equivalents; ENAS 130 or some knowledge of Matlab, C++, or Fortran programming; ENAS 194 or equivalent. ENAS 440 is not a prerequisite. QR

*** MENG 450b / APHY 450b / ENAS 450b, Advanced Synchrotron Techniques and Electron Spectroscopy of Materials** Charles Ahn

Introduction to concepts of advanced x-ray and electron-based techniques used for understanding the electronic, structural, and chemical behavior of materials. Students learn from world-leading experts on fundamentals and practical applications of various diffraction, spectroscopy, and microscopy methods. Course highlights the use of synchrotrons in practical experiments. Prerequisites: physics and quantum mechanics/physical chemistry courses for physical science and engineering majors, or by permission of instructor. QR, SC

MENG 459a / BENG 459a, Neuromuscular Biomechanics Madhusudhan Venkadesan

Mechanics and control of animal movement, including skeletal muscle mechanics, systems-level neural and sensory physiology, elements of feedback control, and optimal control. Deriving equations of motion for multibody mechanical systems that are actuated by muscles or muscle-like motors; incorporating sensory feedback; analyzing system properties such as stability and energetics. Prerequisites: MENG 383 and MATH 222 or equivalents, and familiarity with MATLAB or a similar scientific computing environment. QR RP

MENG 464b, Forces on the Nanoscale Udo Schwarz

Modern materials science often exploits the fact that atoms located at surfaces or in thin layers behave differently from bulk atoms to achieve new or greatly altered material properties. The course provides an in-depth discussion of intermolecular and surface forces, which determine the mechanical and chemical properties of surfaces. In the

first part, we discuss the fundamental principles and concepts of forces between atoms and molecules. Part two generalizes these concepts to surface forces. Part three then gives a variety of examples. The course is of interest to students studying thin-film growth, surface coatings, mechanical and chemical properties of surfaces, soft matter including biomembranes, and colloidal suspensions. Some knowledge of basic physics, mathematics, chemistry, and thermodynamics is expected. SC

*** MENG 469a, Aerodynamics** Juan Fernández de la Mora

Review of fluid dynamics. Inviscid flows over airfoils; finite wing theory; viscous effects and boundary layer theory. Compressible aerodynamics: normal and oblique shock waves and expansion waves. Linearized compressible flows. Prerequisite: MENG 361 or permission of instructor. QR, SC

*** MENG 471a and MENG 472b, Special Projects I** Joran Booth

Faculty-supervised one- or two-person projects with emphasis on research (experiment, simulation, or theory), engineering design, or tutorial study. Students are expected to consult the course instructor, director of undergraduate studies, and/or appropriate faculty members to discuss ideas and suggestions for topics. Focus on development of professional skills such as writing abstracts, prospectuses, and technical reports as well as good practices for preparing posters and delivering presentations. Permission of adviser and director of undergraduate studies is required.

MENG 487La / MENG 488Lb, Mechanical Design: Process and Implementation I

Staff

This course is the first half of the capstone design sequence (students take MENG 488 in the spring semester of the same academic year) and is a unique opportunity to apply and demonstrate broad and detailed knowledge of engineering in a team effort to design, construct, and test a functioning engineering system. The lecture portion of the class provides guidance in planning and managing your project, as well other topics associated with engineering design. This course sequence requires quality design; analyses and experiments to support the design effort; and the fabrication and testing of the engineered system; as well as proper documentation and presentation of results to a technical audience. Prerequisites: MENG 280 and MENG 361. MENG 185 and MENG 325 are strongly suggested. ½ Course cr

MENG 488Lb / MENG 487La, Mechanical Design: Process and Implementation II

Staff

This course is the second half of the capstone design sequence (students take MENG 487 in the fall semester of the same academic year) and is a unique opportunity to apply and demonstrate broad and detailed knowledge of engineering in a team effort to design, construct, and test a functioning engineering system. The lecture portion of the class provides guidance in planning and managing your project, as well other topics associated with engineering design. This course sequence requires quality design; analyses and experiments to support the design effort; and the fabrication and testing of the engineered system; as well as proper documentation and presentation of results to a technical audience. Prerequisites: MENG 487, MENG 280, and MENG 361. MENG 185 and MENG 325 are strongly suggested. ½ Course cr

Modern Middle East Studies

Director of undergraduate studies: Jonathan Wyrzten (jonathan.wyrzten@yale.edu), Rm. 307, 493 College St., 432-5172; www.yale.edu/macmillan/cmcs

The Modern Middle East Studies major focuses on the culture, history, religion, politics, and society of the modern Middle East in its full geographical breadth, while developing expertise in any of the major languages associated with the region, namely Arabic, Hebrew, Persian, and Turkish. Courses are drawn from departments in the humanities and social sciences, including Anthropology, History, History of Art, Judaic Studies, Political Science, Near Eastern Languages and Civilizations, Religious Studies, and Sociology. The Modern Middle East Studies major gives students the analytical and linguistic skills necessary to master the complex issues of the Middle East and serves as excellent preparation for graduate study or for professional careers in which an understanding of that region is essential.

REQUIREMENTS OF THE MAJOR

The major allows students to develop highly individualized courses of study, tailored to their own academic, intellectual, and linguistic interests. There are no prerequisites. Twelve term courses are required for the major, including one course at the L5 level in a Middle Eastern language and two survey courses on the modern period, taken at the introductory level. Beyond those requirements, students take eight distribution courses focusing on any aspect of the culture, thought, history, religion, politics, and society of the region. These eight distribution courses must be spread geographically and temporally and include two courses from two different regions or countries within the Middle East, two courses from different departments or programs, and two that focus substantially on the period before 1750. These courses must draw from distinct methodological or disciplinary approaches and must include two advanced seminars. Up to two language courses below L5 in a Modern Middle East language may count toward the distributional requirement with approval of the director of undergraduate studies (DUS). The proposed course of study also requires DUS approval.

SENIOR REQUIREMENT

Students in the major undertake a one- or two-term senior essay that involves use of materials in one or more modern Middle Eastern languages. Each student selects a faculty adviser with competence in the appropriate language. A prospectus and outline signed by the adviser must be submitted to the DUS by the end of the fourth week of classes in either term of the senior year. Senior essays are graded by the adviser and a second reader. See the course descriptions of the senior essay courses (MMES 491, 492, 493) for further information. Alternatively, under supervision of the instructor, majors may take an additional seminar and write an essay in that course to fulfill the senior requirement.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 12 term courses

Distribution of courses 2 intro survey courses on the Middle East, focusing on the modern period; 2 courses from different Middle Eastern regions or countries;

2 courses from two different departments or programs; 2 courses with focus on pre-1750; 2 adv seminars; and 1 course at L5 level in a Middle East language

Substitution permitted With DUS approval, up to 2 language courses below L5 in Modern Middle East language may count toward distrib requirement

Senior requirement One term senior essay (MMES 491), two term senior essay (MMES 492, 493), or essay written in additional seminar

FACULTY ASSOCIATED WITH THE PROGRAM OF MODERN MIDDLE EAST STUDIES

Professors Abbas Amanat (*History*), Gerhard Böwering (*Religious Studies*), John Darnell (*Near Eastern Languages & Civilizations*), Stephen Davis (*Religious Studies*), Steven Fraade (*Religious Studies*), Eckart Frahm (*Near Eastern Languages & Civilizations*), Frank Griffel (*Religious Studies*), Christine Hayes (*Religious Studies*), Hannan Hever (*Comparative Literature*), Marcia Inhorn (*Anthropology*), Anthony Kronman (*Law School*), Joseph Manning (*Classics, History*), Ivan Marcus (*History*), Alan Mikhail (*History*), A. Mushfiq Mobarak (*School of Management*), Robert Nelson (*History of Art*), Kishwar Rizvi (*History of Art*), Maurice Samuels (*French*), Shawkat Toorawa (*Near Eastern Languages & Civilizations*), Harvey Weiss (*Near Eastern Languages & Civilizations*)

Associate Professors Zareena Grewal (*American Studies*), Kaveh Khoshnood (*Public Health*), Mark Lazenby (*School of Nursing*), Eliyahu Stern (*Religious Studies*), Jonathan Wyrzten (*Sociology*), Travis Zadeh (*Religious Studies*)

Assistant Professors Thomas Connolly (*French*), Robyn Creswell (*Comparative Literature*), Jill Jarvis (*French*), Elizabeth Nugent (*Political Science*), Eda Pepi (*Women's, Gender, & Sexuality Studies*), Evren Savci (*Women's, Gender, & Sexuality Studies*)

Senior Lecturers Geetanjali Singh Chanda (*Women's, Gender, & Sexuality Studies*), Supriya Gandhi (*Religious Studies*), Tolga Köker (*Economics*), Kathryn Slanski (*Near Eastern Languages & Civilizations*)

Lecturers Karla Britton (*Architecture*), Karen Foster (*History of Art*), Nicholas Lolito (*Political Science*), Emma Sky (*Global Affairs*)

Senior Lecturer II Shiri Goren

Senior Lectors Sarab Al Ani, Muhammad Aziz, Jonas Elbousty, Dina Roginsky, Farkhondeh Shayesteh

Lector Orit Yeret

Introductory Survey Course

MMES 191a / RLST 100a, Introduction to World Religions Gerhard Böwering
Introduction to the literature, ideals, concepts, practices, rituals, and institutions of four major world religions as they have appeared in history: Hinduism, Buddhism, Christianity, and Islam. A historical survey combined with a phenomenological treatment of principal topics. HU

Courses

MMES 121a / PLSC 121a, International Relations of the Middle East Nicholas Lotito

This course explores the multiple causes of insecurity in the Middle East and North Africa, a region of paramount geostrategic interest, whose populations have suffered from armed conflicts both within and across national borders. The first half of the course interrogates traditional security concepts like war, terrorism, and revolution, as well as the political, economic, and social contexts which give rise to these phenomena. The course then turns to foreign policy analysis in case studies of the region's major states. Previous coursework in international relations and/or Middle East politics or history recommended but not required. SO

MMES 148b / HIST 345b / JDST 265b / RLST 202b, Jews in Muslim Lands from the Seventh to the Sixteenth Centuries Staff

Jewish culture and society in Muslim lands from the time of the Prophet Muhammad to that of Suleiman the Magnificent. Topics include Islam and Judaism; Jerusalem as a holy site; rabbinic leadership and literature in Baghdad; Jewish courtiers, poets, and philosophers in Muslim Spain; and the Jews in the Ottoman Empire. HU RP

* **MMES 150a / HEBR 150a / JDST 213a, Advanced Modern Hebrew: Daily Life in Israel** Orit Yeret

An examination of major controversies in Israeli society. Readings include newspaper editorials and academic articles as well as documentary and historical material. Advanced grammatical structures are introduced and practiced. Conducted in Hebrew. Prerequisite: HEBR 140 or equivalent. L5 RP

* **MMES 161a / HEBR 162a / JDST 319a, Israel in Ideology and Practice** Dina Roginsky

An advanced Hebrew class focusing on changing ideology and politics in Israel. Topics include right and left wing political discourse, elections, State-Religion dynamics, the Jewish-Arab divide, and demographic changes. Materials include newspapers, publications, on-line resources, speeches of different political and religious groups, and contemporary and archival footage. Comparisons to American political and ideological discourse. Prerequisite: HEBR 140 or permission of instructor. L5 RP

* **MMES 162b / HEBR 169b / JDST 403b, Languages in Dialogue: Hebrew and Arabic** Dina Roginsky

Hebrew and Arabic are closely related as sister Semitic languages. They have a great degree of grammatical, morphological, and lexical similarity. Historically, Hebrew and Arabic have been in cultural contact, especially in medieval Spain, the Middle East, and North Africa – as evidenced by the Judeo-Arabic languages. In modern Israel, Arabic is the native tongue of about 20% of its population, yet lack of communication exists today between Hebrew speakers and Arabic speakers for mainly political reasons. This L5 advanced Hebrew class explores cultural and linguistic contacts between the two languages and relationships between the communities, including both Jewish and non-Jewish Arabic speakers and Hebrew speakers. Additionally, students benefit from regular meetings with a parallel L5 Arabic class which discusses similar topics. The shared meetings enable Hebrew learners and Arabic learners to participate together in one class, to promote social interaction based on mutual respect and to focus on cultural and linguistic aspects of the material. L4 Hebrew or equivalent (placement test). L5

TR RP

* **MMES 166a / HEBR 167a / JDST 402a, Creative Writing in Hebrew** Orit Yeret
 An advanced language course with focus on creative writing and self-expression. Students develop knowledge of modern Hebrew, while elevating writing skills based on special interests, and in various genres, including short prose, poetry, dramatic writing, and journalism. Students engage with diverse authentic materials, with emphasis on Israeli literature, culture, and society. Prerequisite: HEBR 140 or placement exam. L5
 RP

* **MMES 167b / HEBR 164b / JDST 417b, Biblical to Modern Hebrew for Reading Knowledge** Dina Roginsky
 Instruction in the linguistic needs of students who have reading knowledge of Biblical Hebrew but cannot read or converse in Modern Hebrew. Concentration on reading comprehension of Modern Hebrew for research purposes, particularly scholarly texts tailored to students' areas of interest. Two years of Biblical or Modern Hebrew studies, or permission of the instructor. RP

* **MMES 168b / HEBR 158b / JDST 305b, Contemporary Israeli Society in Film** Shiri Goren
 Examination of major themes in Israeli society through film, with emphasis on language study. Topics include migration, gender and sexuality, Jewish/Israeli identity, and private and collective memory. Readings in Hebrew and English provide a sociohistorical background and bases for class discussion. HEBR 140 or permission of instructor. L5, HU RP

* **MMES 178b / ARBC 176b, Languages in Dialogue: Arabic and Hebrew** Sarab Al Ani
 Arabic and Hebrew are closely related as sister Semitic languages. They have a great degree of grammatical, morphological, and lexical similarity. Historically, Arabic and Hebrew have been in cultural contact, especially in medieval Spain, the Middle East, and North Africa – as evidenced by the Judeo-Arabic languages. Arabic is the native tongue of about 20% of the population that resides in Israel, yet lack of communication exists today between Hebrew speakers and Arabic speakers. This L5 advanced Arabic class explores cultural and linguistic contacts between the two languages as well as parallel aspects between the communities. Additionally, students benefit from regular meetings with a corresponding L5 Hebrew class, which discusses similar topics. The shared meetings enable Arabic learners and Hebrew learners to participate together in one class, to bring to light the similarities between the two sister languages and to explore key social issues based on mutual respect while focusing on cultural and linguistic aspects of the material. L5 in Arabic, or equivalent (placement test). L5

MMES 193b / HIST 351b / RLST 155b, The Golden Age of Islam Gerhard Bowering
 The development of Islamic civilization in the Middle East, North Africa, Spain, Iran, and India from Muhammad through the Mongol invasions to the rise of the Ottoman, Safavid, and Mughal empires (600–1500 C.E.). Emphasis on the intellectual and religious history of Islam in the age of the caliphates and during the rule of regional dynasties. HU

* **MMES 236a / JDST 256a / NELC 232a / RLST 400a, The Dead Sea Scrolls: The Damascus Document** Steven Fraade
 Study of the Damascus Document, one of the most important of the Dead Sea Scrolls. Attention to the document's place in the history of biblical interpretation and ancient

Jewish law; the nature and rhetorical function of its textual practices, both narrative and legal; and its relation to the central sectarian writings of the Qumran community. Prerequisite: reading proficiency in ancient Hebrew. L5, HU

* **MMES 262a / ARBC 162a, Modern Arabic Political Thought** Sarab Al Ani
Works by influential Arab thinkers, leaders, and politicians who represent liberal nationalism, Arab nationalism, Islamism, and critiques of contemporary Arab society. Ways in which the authors use language both to portray their beliefs and to shape new social concepts in the Arab world. Prerequisite: ARBC 151 or equivalent, or with permission of the instructor. L5 RP

* **MMES 271a / GBL 271a, Middle East Politics** Emma Sky
Exploration of the international politics of the Middle East through a framework of analysis that is partly historical and partly thematic. How the international system, as well as social structures and political economy, shape state behavior. Consideration of Arab nationalism; Islamism; the impact of oil; Cold War politics; conflicts; liberalization; the Arab-spring, and the rise of the Islamic State. SO

MMES 290a / PLSC 435a / RLST 290a, Islam Today: Jihad and Fundamentalism
Frank Griffel
Introduction to modern Islam, including some historical background. Case studies of important countries in the contemporary Muslim world, such as Egypt, Iran, Pakistan, and Saudi Arabia. Islam as a reactive force to Western colonialism; the ideals of Shari'a and jihad; violence and self-sacrifice; and Islam as a political ideology. HU

* **MMES 342a / HIST 232Ja / HUMS 443a / JDST 270a / RLST 201a, Medieval Jews, Christians, and Muslims In Conversation** Ivan Marcus
How members of Jewish, Christian, and Muslim communities thought of and interacted with members of the other two cultures during the Middle Ages. Cultural grids and expectations each imposed on the other; the rhetoric of otherness – humans or devils, purity or impurity, and animal imagery; and models of religious community and power in dealing with the other when confronted with cultural differences. Counts toward either European or Middle Eastern distributional credit within the History major, upon application to the director of undergraduate studies. WR, HU RP

* **MMES 442a / HIST 347Ja, From the Great Game to the Great Satan: Iran, Afghanistan, and Central Asia in the Age of Empires** Abbas Amanat
Encounters of Iran and its neighbors with Britain, Russia, and the United States since the nineteenth century. Special attention to Western imperial interests in the region and to indigenous forms of resistance to imperial hegemony. Topics include travel, diplomacy, war and hegemony, postcolonial sovereignty, the Cold War and regional power, and the Islamic Republic's demonizing of America. WR, HU

Directed Study and Senior Essay Courses

* **MMES 471a and MMES 472b, Independent Directed Study** Staff
Independent research or directed reading under the direction of a faculty member in the program on a special topic in Modern Middle East Studies not substantially covered by an existing undergraduate or graduate course. A proposal describing the nature of the program and the readings to be covered must be signed by the adviser and submitted to the director of undergraduate studies by the end of the second week of classes. The

student should meet with the adviser regularly, typically for an hour a week, and write one term essay or several short essays.

*** MMES 491a or b, Senior Essay** Staff

The one-term senior essay is a research paper of at least thirty pages prepared under the supervision of a faculty member in accordance with the following schedule: (1) by the end of the second week of classes of the term, students meet with advisers to discuss the essay's topic, approach, sources, and bibliography; (2) by the end of the fourth week of classes a prospectus with outline, including an annotated bibliography of materials in one or more modern Middle Eastern languages and of secondary sources, is signed by the adviser and submitted to the director of undergraduate studies. The prospectus should indicate the formal title, scope, and focus of the essay, as well as the proposed research method, including detailed indications of the nature and extent of materials in a modern Middle Eastern language that will be used; (3) at the end of the tenth week of classes, a rough draft of the complete essay is submitted to the adviser; (4) by 4 p.m. on the last day of reading period, two copies of the finished paper must be submitted to the MMES registrar, 115 Prospect St., room 344. A late essay will receive a lower grade. Senior essays are graded by faculty associated with the Modern Middle East Studies program unless, for exceptional reasons, different arrangements for another reader have been made in advance with the director of undergraduate studies and the faculty adviser.

MMES 492a and MMES 493b, The Yearlong Senior Essay Staff

The yearlong senior essay is a research paper of at least sixty pages prepared under the supervision of a faculty member in accordance with the following schedule: (1) by the end of the second week of classes of the first term, students meet with advisers to discuss the essay's topic, approach, sources, and bibliography; (2) by the end of the fourth week of classes a prospectus with outline, including an annotated bibliography of materials in one or more modern Middle Eastern languages and of secondary sources, is signed by the adviser and submitted to the director of undergraduate studies. The prospectus should indicate the formal title, scope, and focus of the essay, as well as the proposed research method, including detailed indications of the nature and extent of materials in a modern Middle Eastern language that will be used; (3) at the end of February, a rough draft of the complete essay is submitted to the adviser; (4) by 4 p.m. on the last day of reading period in the spring term, two copies of the finished paper must be submitted to the MMES registrar, 115 Prospect St., room 344. A late essay will receive a lower grade. Senior essays are graded by faculty associated with the Modern Middle East Studies program unless, for exceptional reasons, different arrangements for another reader have been made in advance with the director of undergraduate studies and the faculty adviser. Credit for MMES 492 only on completion of MMES 493.

Molecular Biophysics and Biochemistry

Director of undergraduate studies: Andrew Miranker (andrew.miranker@yale.edu), 318 BASS, 432-8954, MBBUndergrad@yale.edu; mb&b.yale.edu

The programs offered by the Department of Molecular Biophysics and Biochemistry are planned for students interested in the molecular and chemical basis of biological processes and are well suited to students hoping to attend medical school or pursue graduate studies in biochemistry, molecular biology, genetics, or biophysics. The B.S. major, designed for those with a strong commitment to research, provides an intensive introduction to laboratory techniques in biochemistry and biophysics. Students in this program usually carry out research projects in faculty laboratories during their junior and senior years. The B.A. major provides the intellectual discipline of biochemistry and biophysics for students who also wish to have sufficient time to pursue in-depth studies outside the major or who are interested in molecular biology as a liberal education; they too may engage in research during their junior and senior years.

PREREQUISITES

The basic science courses required of all majors include four half-term units of foundational biology (BIOL 101, 102, 103, 104); a two term lecture sequence in general chemistry with its associated laboratories; a first term course in organic chemistry with its associated laboratory; and two terms of calculus (MATH 112 and 116). The prerequisites in biology, chemistry, and mathematics may be satisfied by scores on Advanced Placement tests or placement examinations sufficient to earn acceleration credits in the particular subjects, even if the student does not choose to accelerate.

REQUIREMENTS OF THE MAJOR

The major for the Class of 2020 With the approval of the director of undergraduate studies (DUS), the following changes to the requirements of the major may be fulfilled by students who declared their major under previous requirements.

B.S. degree program for the Class of 2021 and subsequent classes Thirteen courses are required beyond the prerequisites: a second term of organic chemistry with its associated laboratory; two term courses in physics numbered PHYS 170 or higher; one term of physical chemistry; MB&B 251L, 300, 301, 302, and 490; two additional upper-level MB&B electives, one of which must not be a laboratory or independent research course; one quantitative reasoning elective (e.g., MATH 120 or above, S&DS 105 or 230 or above, CPSC 201 or above, or ENAS 130 or above); and one elective in the natural sciences at a level higher than required in the prerequisites. Students choose the elective courses in consultation with a faculty adviser (see below). Only two course credits of MB&B 470, 471, and 478, 479 may count toward these electives. Students may substitute CHEM 333 for MB&B 302. The physics requirement may be satisfied by an Advanced Placement test score sufficient to earn acceleration credit in that subject. The quantitative reasoning requirement may not be fulfilled by Advanced Placement test scores.

B.A. degree program for the Class of 2021 and subsequent classes Eleven courses are required beyond the prerequisites: a second term of organic chemistry with its associated laboratory; two term courses in physics numbered PHYS 170 or higher; one term of physical chemistry; MB&B 251L, 300, 301, 302, and 490; one additional upper-

level MB&B elective; and one quantitative reasoning elective (e.g., MATH 120 or above, S&DS 105 or 230 or above, CPSC 201 or above, or ENAS 130 or above). Students choose the elective courses in consultation with a faculty adviser (see below). Students may substitute CHEM 333 for MB&B 302. The physics requirement may be satisfied by an Advanced Placement test score sufficient to earn acceleration credit in that subject. The quantitative reasoning requirement may not be fulfilled by Advanced Placement test scores.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

Roadmap See visual roadmap of the requirements.

SENIOR REQUIREMENT

The senior requirement for both the B.S. and the B.A. is fulfilled by successful completion of the senior project, MB&B 490. Students enrolled in this course prepare a written report and make an oral presentation of a literature project. Students meet with faculty members in charge of the colloquium during the first two weeks of the spring term to agree on a topic and an approach. It is appropriate for students who took research for credit earlier in their training to write on their research topic. It is inappropriate for students to submit a revised version of a past research report or to resubmit a literature paper prepared for another course. The literature project for the senior requirement should be original work approved by the faculty member overseeing the senior colloquium.

The written report is expected to be 15–25 pages in length (double-spaced, twelve-point font, exclusive of figures). A first draft of the paper is due two weeks prior to the date of the oral presentation. Faculty in charge of the program will review the draft and return it to the student with suggestions. A final draft of the paper is due the first day of the reading period in the student's final term.

Students make a fifteen-minute oral presentation during the last three weeks of their final term in a general scientific forum open to the public. Other students in the series are expected to attend all presentations.

ADVISING

Recommended courses All B.S. majors are encouraged to include MB&B 470 or 471 among their MB&B electives. Declared MB&B majors may take up to two credits of these independent research courses for a letter grade. The prerequisites in either general or organic chemistry should be taken in the first year.

Students with a strong interest in biophysics, including those planning to attend graduate school, are strongly encouraged to take courses beyond the basic requirements of the major. Such students are advised to take mathematics through differential equations (ENAS 194, MATH 246, or PHYS 301) and a full year of physical chemistry (CHEM 328 or 332, and 333). In place of one term of biophysics (MB&B 302) they may elect a full year of upper-level biophysics (MB&B 420 and graduate courses in optical spectroscopy and macromolecular interactions). Such revisions to the basic curriculum must be made in consultation with the faculty adviser.

Graduate work Graduate courses in molecular biophysics and biochemistry, biology, and the biomedical sciences that may be of interest to undergraduates are listed in

the Graduate School bulletin, and many are posted on the Biological and Biomedical Sciences website. Additional information is available from the DUSes and the director of graduate studies. Undergraduates with an appropriate background may enroll with the permission of the director of graduate studies and the instructor.

Typical programs Programs with the minimal number of science courses required of B.A. and B.S. majors are shown below. Students whose scores on the Advanced Placement tests make them eligible for advanced courses are urged to replace the elementary science courses with more advanced ones in their first year, and to complete the required biochemistry and physics courses by the end of their sophomore and junior years, respectively. Students are permitted to take the biochemistry sequence (MB&B 300, 301) after one term of organic chemistry (CHEM 220).

First-Year	Sophomore	Junior	Senior
BIOL 101, 102, 103, 104	CHEM 220, 221, 222L, 223L	MB&B 300, 301, 251L	CHEM 328
CHEM 161, 165, 134L, 136L	MATH 112, 116	One quantitative reasoning elective PHYS 180, 181	MB&B 302 One MB&B elective And, for B.S. major: One science elective and a second MB&B elective MB&B 490

Combined B.S./M.S. degree program Exceptionally able and well-prepared students may complete a course of study leading to the simultaneous award of the B.S. and M.S. degrees after eight terms of enrollment. See Academic Regulations, section K, Special Arrangements, "Simultaneous Award of the Bachelor's and Master's Degrees." Interested students should consult the DUS prior to the sixth term of enrollment for specific requirements in Molecular Biophysics and Biochemistry.

MB&B faculty advisory system Two MB&B faculty serve as academic advisers for each class year. Students may choose either of the advisers as listed for their class year and maintain an advising relationship throughout their studies. The advisers are apprised of curriculum-related details for each year and are authorized to sign schedules. Members acting as faculty advisers are:

Class of 2020:

E. De La Cruz, 336A BASS (432-5424)

C. Sindelar, CE25 SHM (737-4752)

Class of 2021:

W. Gilbert, C-127 SHM (785-4857)

A. Miranker, 313 BASS (432-8954)

Class of 2022:

C. Paulsen, 234 BASS (432-5342)

M. Koelle, CE28A SHM (737-5808)

Class of 2023:

L. Kabeche, TBD

M. Simon, 220 BASS (737-3274)

REQUIREMENTS OF THE MAJOR

Prerequisites *B.S.* and *B.A.* – BIOL 101, 102, 103, and 104; a two-term lecture sequence in general chem, with labs, and 1 term of organic chem with lab; MATH 112, 116

Number of courses *B.S.* – 13 term courses beyond prereqs, incl senior req; *B.A.* – 11 term courses beyond prereqs, incl senior req

Specific courses required *B.S.* and *B.A.* – MB&B 251L, 300, 301, 302

Distribution of courses *B.S.* – a second term of organic chem with lab; 1 term of physical chem; two terms of PHYS 170 or above; 2 addtl upper-level MB&B electives, 1 quantitative reasoning elective, and 1 natural science elective, all as specified; *B.A.* – a second term of organic chem with lab; 1 term of physical chem; two terms of PHYS 170 or above; 1 addtl upper-level MB&B elective and 1 quantitative reasoning elective, as specified

Substitution permitted CHEM 333 for MB&B 302

Senior requirement Senior project (MB&B 490)

FACULTY OF THE DEPARTMENT OF MOLECULAR BIOPHYSICS AND BIOCHEMISTRY

Professors †Karen Anderson, Susan Baserga, †Ronald Breaker, †Gary Brudvig, †Sandy Chang, Enrique De La Cruz, †Daniel DiMaio, Donald Engelman, Alan Garen, Mark Gerstein, Nigel Grindley (*Emeritus*), †Sharon Hammes-Schiffer, Mark Hochstrasser, Jonathon Howard, Michael Koelle, Anthony Koleske, William Konigsberg, †Mark Lemmon, Peter Lengyel (*Emeritus*), †Patrick Loria, †I. George Miller, Andrew Miranker, †Peter Moore (*Emeritus*), Karla Neugebauer, †Thomas Pollard, †Karen Reinisch, †David Schatz, Robert Schulman (*Emeritus*), †Frederick Sigworth, Dieter Söll, Mark Solomon, Joan Steitz, Scott Strobel, Yong Xiong

Associate Professors †Titus Boggon, Wendy Gilbert, Christian Schlieker, Matthew Simon, Chuck Sindelar, †Shervin Takyar, †Yongli Zhang

Assistant Professors Julien Berro, Franziska Bleichert, Lilian Kabeche, †Erdem Karatekin, Nikhil Malvankar, †Wei Mi, Candice Paulsen, †Sarah Slavoff, Kai Zhang

Adjunct Professors Kenneth Williams, Carl Zimmer

Lecturer Aruna Pawashe

†A joint appointment with primary affiliation in another department.

Courses

* **MB&B 050b, Topics in Cancer Biology** Sandy Chang

Introduction to cancer as a genetic disease, with a focus on major discoveries in cancer biology that offer mechanistic insights into the disease process. A brief history of cancer; influence of the genomic revolution on cancer diagnostics; molecular defects underlying specific cancers; current and future cancer therapeutics. Patient case studies highlight specific molecular pathways and treatment strategies. Enrollment limited to first-year students with a strong background in biology and/or chemistry, typically demonstrated by a score of 5 on Advanced Placement examinations. Preregistration required; see under First-Year Seminar Program. WR, SC

* **MB&B 060a, Molecular Medicine** Sandy Chang

The main purpose of this course is to use benign and malignant hematological disorders to introduce fundamental concepts in molecular and cellular biology. Students emerge from this course with a firm understanding of the molecular pathways perturbed in various hematological disorders and the therapeutics currently used to exploit these pathways for disease treatment. Through lectures and reading of primary scientific literature, students learn about landmark discoveries in hematology and how these discoveries contribute to understanding of the normal hematopoietic system, and when perturbed, how diseases arise. Students also learn to (1) read primary scientific literature, (2) synthesize this material to present to the class and (3) learn how to write a short grant proposal. These skills are essential for any successful scientist or physician, and it's important to master them early. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. Prerequisite: score of 5 on the AP Biology exam or AP Chemistry exam. WR, SC

MB&B 105a or b / MCDB 105a or b, Biology, the World, and Us Staff

Biological concepts taught in context of current societal issues, such as emerging diseases, genetically modified organisms, green energy, and the human brain and its disorders. Emphasis on biological literacy to enable students to evaluate scientific arguments. SC

* **MB&B 107b / EDST 107b / PHYS 107b, Being Human in STEM** Rona Ramos

A collaboratively-designed, project-oriented course that seeks to examine, understand, and disseminate how diversity of gender, race, religion, sexuality, economic circumstances, etc. shape the STEM experience at Yale and nationally, and that seeks to formulate and implement solutions to issues that are identified. Study of relevant peer-reviewed literature and popular-press articles. Implementation of a questionnaire and interviews of STEM participants at Yale. Creation of role-play scenarios for provoking discussions and raising awareness. Design and implementation of group interventions. SO

[MB&B 110, Current Issues in Biological Science]* **MB&B 200a / MCDB 300a, Biochemistry** Ronald Breaker and Donald Engelman

An introduction to the biochemistry of animals, plants, and microorganisms, emphasizing the relations of chemical principles and structure to the evolution and regulation of living systems. Prerequisites: BIOL 101 or equivalent performance on the corresponding biological sciences placement examination; one term of organic chemistry; or with permission of instructor. SC

[MB&B 230, Rain Forest Expedition and Laboratory]* **MB&B 251La or b / MCDB 301La or b, Laboratory for Biochemistry** Aruna Pawashe and Staff

An introduction to current experimental methods in molecular biology, biophysics, and biochemistry. Limited enrollment. Requires preregistration by e-mail to aruna.pawashe@yale.edu and william.konigsberg@yale.edu prior to the first week of classes. Please note: During the fall term, this course runs as two sections, Tuesday or Thursday from 1.15pm-5.15pm, for the entire semester. During the spring term it meets twice a week, Tuesday and Thursday, but only for the first half of the semester. Prerequisite: BIOL 101. SC ½ Course cr

MB&B 300a, Principles of Biochemistry I Matthew Simon, Michael Koelle, and Candice Paulsen

Discussion of the physical, structural, and functional properties of proteins, lipids, and carbohydrates, three major classes of molecules in living organisms. Energy metabolism and hormone signaling as examples of complex biological processes whose underlying mechanisms can be understood by identifying and analyzing the molecules responsible for these phenomena. After BIOL 101; after or concurrently with CHEM 175 (or CHEM 125) or 220 SC

MB&B 301b, Principles of Biochemistry II Christian Schlieker and Joan Steitz
Building on the principles of MB&B 300 through study of the chemistry and metabolism of DNA, RNA, and proteins. Critical thinking emphasized by exploration of experimental methods and data interpretation, from classic experiments in biochemistry and molecular biology through current approaches. Prerequisite: MB&B 300 or permission of instructor. SC

MB&B 302b, Principles of Biophysics Enrique De La Cruz and Charles Sindelar
An introduction to the theoretical basis of biophysical concepts and approaches with selected examples and applications. Prerequisites: MB&B 300 and CHEM 328. SC

MB&B 330a / MCDB 330a / NSCI 324a, Modeling Biological Systems I Thierry Emonet and Kathryn Miller-Jensen
Study of the analytic and computational skills needed to model genetic networks and protein signaling pathways. Review of basic biochemical concepts including chemical reactions, ligand binding to receptors, cooperativity, and Michaelis-Menten enzyme kinetics. Deep exploration of biological systems including: kinetics of RNA and protein synthesis and degradation; transcription activators and repressors; lysogeny/lysis switch of lambda phage and the roles of cooperativity and feedback; network motifs such as feed-forward networks and how they shape response dynamics; cell signaling, MAP kinase networks and cell fate decisions; bacterial chemotaxis; and noise in gene expression and phenotypic variability. Students learn to model using MatLab in a series of in-class hackathons that illustrate biological examples discussed in lectures. Prerequisites: BIOL 101-104, or with permission of instructors. QR, SC

MB&B 361b / BENG 465b / MCDB 361b / NSCI 325b, Modeling Biological Systems II
Damon Clark, Thierry Emonet, and Jonathon Howard
Advanced topics related to dynamical processes in biological systems. Processes by which cells compute, count, tell time, oscillate, and generate spatial patterns. Time-dependent dynamics in regulatory, signal-transduction, and neuronal networks; fluctuations, growth, and form. Comparisons between models and experimental data. Dynamical models applied to neurons, neural systems, and cellular biophysical processes. Use of MATLAB to create models. Prerequisite: MCDB 330 or equivalent, or a 200-level biology course, or with permission of instructor. QR

MB&B 420a, Macromolecular Structure and Biophysical Analysis Yong Xiong, Susan Baserga, Jonathon Howard, Nikhil Malvankar, and Kai Zhang
Analysis of macromolecular architecture and its elucidation using modern methods of structural biology and biochemistry. Topics include architectural arrangements of proteins, RNA, and DNA; practical methods in structural analysis; and an introduction to diffraction and NMR. Prerequisites: MBB 301 and 302. SC

*** MB&B 425a / MCDB 425a, Basic Concepts of Genetic Analysis** Jun Lu

The universal principles of genetic analysis in eukaryotes. Reading and analysis of primary papers that illustrate the best of genetic analysis in the study of various biological issues. Focus on the concepts and logic underlying modern genetic analysis. Prerequisite: MCDB 202 or pre-approval of instructor. SC

MB&B 435a, Quantitative Approaches in Biophysics and Biochemistry Julien Berro, Yong Xiong, and Nikhil Malvankar

An introduction to quantitative methods relevant to analysis and interpretation of biophysical and biochemical data. Topics include statistical testing, data presentation, and error analysis; introduction to mathematical modeling of biological dynamics; analysis of large datasets; and Fourier analysis in signal/image processing and macromolecular structural studies. Instruction in basic programming skills and data analysis using MATLAB; study of real data from MB&B research groups. Prerequisites: MATH 120 and MB&B 300 or equivalents, or with permission of instructors. QR, SC

MB&B 443b, Advanced Eukaryotic Molecular Biology Mark Hochstrasser, Matthew Simon, and Karla Neugebauer

Selected topics in regulation of chromatin structure and remodeling, mRNA processing, mRNA stability, translation, protein degradation, DNA replication, DNA repair, site-specific DNA recombination, and somatic hypermutation. Prerequisites: MB&B 300 and 301, or permission of instructor. SC RP

*** MB&B 445b, Methods and Logic in Molecular Biology** Mark Hochstrasser, Christian Schlieker, Nikhil Malvankar, and Candice Paulsen

An examination of fundamental concepts in molecular biology through analysis of landmark papers. Development of skills in reading the primary scientific literature and in critical thinking. Prerequisites: MB&B 300 and 301. SC RP

MB&B 449a, Medical Impact of Basic Science Joan Steitz, Sandy Chang, I. George Miller, Karla Neugebauer, David Schatz, and Seyedtaghi Takyar

Examples of recent discoveries in basic science that have elucidated the molecular origins of disease or that have suggested new therapies for disease. Readings from the primary scientific and medical literature, with emphasis on developing the ability to read this literature critically. Prerequisites: MB&B 300 and 301 or equivalents, or permission of instructor. SC

MB&B 452b / MCDB 452b / S&DS 352b, Biomedical Data Science, Mining and Modeling Mark Gerstein and Matthew Simon

Techniques in data mining and simulation applied to bioinformatics, the computational analysis of gene sequences, macromolecular structures, and functional genomics data on a large scale. Sequence alignment, comparative genomics and phylogenetics, biological databases, geometric analysis of protein structure, molecular-dynamics simulation, biological networks, microarray normalization, and machine-learning approaches to data integration. Prerequisites: MB&B 301 and MATH 115, or permission of instructor. SC

*** MB&B 459a / ENGL 459a / EVST 215a, Writing about Science, Medicine, and the Environment** Carl Zimmer

Advanced non-fiction workshop in which students write about science, medicine, and the environment for a broad public audience. Students read exemplary work, ranging from newspaper articles to book excerpts, to learn how to translate complex subjects

into compelling prose. Admission by permission of the instructor only. Applicants should email the instructor at carl@carlzimmer.com with the following information:

1. One or two samples of nonacademic, nonfiction writing. (No fiction or scientific papers, please.) Indicate the course or publication, if any, for which you wrote each sample.
2. A note in which you briefly describe your background (including writing experience and courses) and explain why you'd like to take the course.

*** MB&B 460Lb, Advanced Laboratory for Biochemistry** Aruna Pawashe and Alan Garen

An advanced laboratory in biochemistry, molecular biology, and biophysics. Students perform experiments on an individual basis that have unknown outcomes using techniques currently used in research labs. Please note that this course meets twice a week for only the second half of the semester, in the same time slot as 251Lb, which meets only the first half of the semester, so that students may conveniently take both 251Lb and 460Lb the same semester. Prerequisite: MB&B 251L or permission of the instructor. SC ½ Course cr

*** MB&B 470a and MB&B 471b, Research in Biochemistry and Biophysics for the Major** Kai Zhang and Karla Neugebauer

Individual laboratory projects under the supervision of a faculty member. Students must submit an enrollment form that specifies the research supervisor by the date that course schedules are due. Students are expected to commit at least ten hours per week to working in a laboratory. Written assignments include a research proposal, due near the beginning of the term, and a research report that summarizes experimental results, due before the beginning of the final examination period. Students receive a letter grade. Up to 2 credits of MB&B 470/471 may be counted toward the MB&B major requirements. Enrollment limited to MB&B majors. Prerequisite: MB&B 251L or permission of the instructor. SC

*** MB&B 472a and MB&B 473b, Research in Biochemistry and Biophysics** Karla Neugebauer and Kai Zhang

Individual laboratory projects under the supervision of a faculty member. Students must submit an enrollment form that specifies the research supervisor by the date that course schedules are due. Students are expected to commit at least ten hours per week to working in a laboratory. Written assignments include a research proposal, due near the beginning of the term, and a research report that summarizes experimental results, due before the beginning of the final examination period. Students are graded pass/fail. Taken after students have completed two credits of MB&B 470 and 471. These courses do not count toward the major requirements. Prerequisites: MB&B 470, 471 and 251L or permission of the instructor. SC

*** MB&B 478a and MB&B 479b, Intensive Research in Biochemistry and Biophysics** Kai Zhang and Karla Neugebauer

Individual laboratory projects under the supervision of a faculty member. Students must submit an enrollment form that specifies the research supervisor by the day that course schedules are due. Students are expected to commit at least twenty hours per week to working in a laboratory. Written assignments include a research proposal, due near the beginning of the term, and a research report that summarizes experimental results, due before the beginning of the final examination period. No more than two

course credits count as electives toward the B.S. degree. Enrollment limited to senior MB&B majors. Prerequisite: MB&B 251L or 360L. 2 Course cr per term

* **MB&B 490b, The Senior Project** Dieter Söll, Julien Berro, and Nikhil Malvankar Colloquium for fulfillment of the senior requirement. The course involves a written and an oral presentation of a senior paper in an area of biochemistry or biophysics. The topic is selected in consultation with the faculty members in charge of the course.

Molecular, Cellular, and Developmental Biology

Director of undergraduate studies: Douglas Kankel (douglas.kankel@yale.edu), 1220B KBT, 432-3839; registrar, Crystal Adamchek (crystal.adamchek@yale.edu), 219 Prospect St., 432-3839; mcdb.yale.edu/

The science of biology is extremely broad, ranging across the domains of molecules, cells, tissues and organs, organisms, and ecosystems. Moreover, biology explores questions of evolutionary history and the processes of evolutionary change, as well as the mechanisms by which cells, organisms, and ecosystems function. Students majoring in Molecular, Cellular, and Developmental Biology receive a thorough yet varied liberal education and preparation for professional careers in a diverse array of fields. Practical applications of biology include the development of biologicals and pharmaceuticals, the practice of medicine, and the pursuit of the scientific bases for understanding the development and function of biological systems.

Molecular, Cellular, and Developmental Biology (MCDB) offers programs for students wishing to concentrate on molecular and cellular biology and genetics, with applications to problems in cell and developmental biology, neurobiology, and various aspects of quantitative biology. Interdisciplinary opportunities are available within the major in the Biotechnology, Neurobiology, and Quantitative Biology tracks.

The MCDB major offers many opportunities for independent laboratory research. With approval, research can be conducted under the supervision of faculty members in any Yale department.

PREREQUISITES

The foundational biology courses required of all MCDB majors are BIOL 101, 102, 103, and 104. All majors must also complete a course in mathematics numbered MATH 115 or higher or a statistics course taken at Yale.

For the B.A. degree, additional prerequisites are a two term lecture sequence in chemistry, and a term course in physics numbered PHYS 170 or higher.

For the B.S. degree, additional prerequisites are a two term lecture sequence in chemistry, with associated laboratories; a term course in organic chemistry with its associated laboratory; and two term courses in physics numbered PHYS 170 or higher.

PLACEMENT PROCEDURES

Placement in MCDB courses is determined by examinations administered at Yale. A student may place out of one or more courses in the BIOL 101–104 sequence. One or more of these foundational biology courses (or equivalent performance on the corresponding biological sciences placement examination) may be explicitly required as prerequisites for upper-level MCDB courses.

Placement in chemistry courses is arranged by the Department of Chemistry. Because required chemistry courses are prerequisite to several MCDB courses, students are strongly encouraged to take general and organic chemistry in the first and/or sophomore years. Students who place out of general chemistry may want to consider taking organic chemistry during the first year. Finishing the prerequisites early allows for a more flexible program in later years.

Acceleration credit awarded in chemistry, mathematics, or physics, or completion of advanced courses in those subjects, is accepted in place of the corresponding prerequisites for the MCDB major. Students who have mathematics preparation equivalent to MATH 115 or higher are encouraged to take additional mathematics courses, such as MATH 120, 222, or 225, or ENAS 151 or 194. Students in the B.A. degree program who have satisfied one or more prerequisites with advanced placement must still complete three term courses in chemistry and physics at Yale, including at least one from each department.

REQUIREMENTS OF THE MAJOR

B.A. degree program The B.A. degree requires a minimum of five and one-half course credits beyond the prerequisites, including five lecture or seminar courses and one laboratory, as follows:

1. Two core courses selected from MCDB 200, 202, 205, 210, 290, 300 (or MB&B 300)
2. Two general electives selected from MCDB courses numbered 250 or above, or two additional core courses from the list above. Two laboratory courses, either MCDB 342L and 343L or MCDB 344L and 345L, can be paired for a single elective credit. If used as an elective, these laboratories cannot also fulfill the laboratory requirement
3. One special elective selected from MCDB courses numbered 350 or higher
4. One laboratory from the biological sciences. Laboratories may be selected from MCDB, or Ecology and Evolutionary Biology, or Molecular Biology and Biophysics, or, with permission of the director of undergraduate studies (DUS), from Anthropology or Biomedical Engineering
5. The senior requirement, described below

B.S. degree program The B.S. degree requires a minimum of nine course credits beyond the prerequisites, including eight lecture or seminar courses and two laboratories, as follows:

1. Three core courses selected from MCDB 200, 202, 205, 210, 290, 300 (or MB&B 300)
2. Two general electives selected from MCDB courses numbered 250 or above. Additional core courses from the list above, a second term of organic chemistry, and courses in statistics may be used as general electives. Two laboratory courses, either MCDB 342L and 343L or MCDB 344L and 345L, can be paired for a single elective credit. If used as an elective, these laboratories cannot also fulfill the laboratory requirement
3. One special elective from MCDB courses numbered 350 or higher
4. Two laboratories from MCDB
5. The senior requirement, described below

The B.S. degree program, intensive major Requirements for the B.S. degree program, intensive major are the same as those for the B.S. degree except for the senior requirement (see below).

Independent research courses before senior year The only independent research course available to students prior to the senior year is MCDB 474. This course is graded pass/fail and contributes to the thirty-six course credits required for the bachelor's degree, but it does not substitute for any MCDB major requirement, including the senior requirement. No independent research course satisfies a laboratory requirement for the MCDB major.

Independent research courses during senior year The research courses MCDB 475, 485, 486, and 495, 496 exist primarily to fulfill the senior requirement, and do not satisfy any other requirement for the major. Note that Yale College limits the number of independent study or independent research courses that students may take; see Academic Regulations, section C, Course Credits and Course Loads. Any independent study course, regardless of its number, is included in the total. No independent research course satisfies a laboratory requirement for the MCDB major.

Credit/D/Fail No course taken Credit/D/Fail may be counted toward the MCDB major, including prerequisites.

Roadmap See visual roadmap of the requirements.

SENIOR REQUIREMENT

In addition to the course requirements described above, all students must satisfy a senior requirement undertaken during the senior year. A booklet listing the senior requirements of each track and degree is available in the office of the DUS (1220B KBT). All students must fill out a checklist of requirements and go over it with the undergraduate registrar, Crystal Adamchek (crystal.adamchek@yale.edu), by the spring term of the junior year.

B.A. degree program For the B.A. degree, the senior requirement can be met either by submitting a senior essay of 15–20 pages evaluating current research in a field of biology, or by successful completion of one term of individual research (MCDB 475). A senior choosing to fulfill the requirement with a senior essay must consult with a faculty adviser on the scope and literature of the topic and submit the adviser's written approval to the DUS no later than the course selection period of the term in which the paper is due. The senior essay may be related to the subject matter of a course, but the essay is a separate departmental requirement in addition to any work done in a course and does not count toward the grade in any course. The senior essay must be completed and submitted to the office of the DUS by the last day of classes. Students electing this option should obtain an approval form from the office of the DUS.

B.S. degree program For the B.S. degree, the senior requirement is usually fulfilled by completing a yearlong research course, MCDB 485, 486. Alternatively, a student can take two consecutive terms of MCDB 475. With permission of the DUS, students taking two terms of MCDB 475 can begin the project during the spring term of the junior year, continue it over the summer, and complete it during the fall term of the senior year. In all other cases, the senior requirement must be completed during the senior year. Yale College does not grant academic credit for summer research unless the student is enrolled in an independent research course in Yale Summer Session. Seniors

working toward the B.S. degree are expected to spend at least ten hours per week in the lab conducting individual research.

B.S. degree program, intensive major Requirements for the B.S. degree with an intensive major are the same as those for the B.S. degree except that students fulfill the senior requirement by taking MCDB 495, 496 for four course credits. Seniors in the intensive major are expected to spend at least twenty hours per week in the lab conducting individual research.

REQUIREMENTS OF THE NEUROBIOLOGY, BIOTECHNOLOGY, AND QUANTITATIVE BIOLOGY TRACKS

Neurobiology track In addition to the core courses for the standard major, the Neurobiology track requires MCDB 320. One elective is selected from MCDB courses numbered 350 or above and one is selected from BENG 410, CPSC 475, MCDB 250, 310, 315, 415, 425, 430, 440, MCDB 361, PSYC 270, 320, 376 or S&DS 101. Other courses may be substituted with the approval of the student's track adviser. (Students should note that PSYC 110 is a prerequisite for many psychology courses but does not substitute as an elective in the Neurobiology track.) The laboratory requirement and the senior requirement are the same as those for the standard major. Students interested in the Neurobiology track should consult an adviser for the track.

Neurobiology track advisers

P. Forscher, 222 KBT (432-6344)

H. Keshishian, 640A KBT (432-3478)

R. Wyman, 610A KBT (432-3475)

W. Zhong, 616 KBT (432-9233)

Biotechnology track In addition to the core courses for the standard major, the Biotechnology track requires MCDB 370. One elective is selected from MCDB courses numbered 350 or above and one is selected from MB&B 420, 421, 443, BENG 351, 352, 410, 435, 457, 463, 464, CENG 210, 411, 412, CPSC 437, 445, 470, or 475. The laboratory requirement and the senior requirement are the same as those for the standard major. Students interested in the Biotechnology track should consult an adviser for the track.

Biotechnology track advisers

R. Breaker, 506 KBT (432-9389)

C. Crews, 452 KBT (432-9364)

F. Isaacs, 802 KBT (432-3783)

K. Nelson, 710A KBT (432-5013)

J. Wolenski, 330 KBT (432-6912)

Quantitative Biology track In addition to the core courses for the standard major, the Quantitative Biology track requires MCDB 330. One elective is selected from MCDB courses numbered 350 or above and one is selected from MCDB 320, 361, 461, BENG 463, 467, CPSC 440, 475, MB&B 302, 435, 452, 523, PHYS 402, MATH 246, 251, or CPSC 475, 440. Two laboratories numbered MCDB 201L or above are also required. Students interested in the Quantitative Biology track should consult an adviser for the track.

Quantitative Biology track advisers

M. Acar, West Campus B-31 (737-3255)

D. Clark, 224 KBT (432-0750)

T. Emonet, 1048 KBT (432-3516)

D. Kankel, 1118 KBT (432-3532)

ADDITIONAL INFORMATION AND ADVISING

The prerequisites for the B.S. degree fulfill most of the usual premedical science requirements. Students who choose the B.A. degree can also prepare for medical school by taking additional premedical courses.

Selection of courses A relevant intermediate or advanced course from another department in science, engineering, mathematics, or statistics may be accepted as an elective with permission of the DUS. Many courses in other departments have prerequisites; such prerequisites can be substituted for an upper-level elective with permission of the DUS.

Residential college seminars cannot be substituted for electives and do not count toward the requirements of the major. The MCDB major should not be taken as one of two majors with Molecular Biophysics and Biochemistry, Ecology and Evolutionary Biology, or with Neuroscience.

Advising First-year students considering a major in Molecular, Cellular, and Developmental Biology are invited to consult with the DUS and/or a faculty member in MCDB who is a fellow of their residential college. For assistance in identifying a suitable adviser, students should contact the departmental undergraduate registrar, Crystal Adamchek (crystal.adamchek@yale.edu). Students in the Biotechnology, Neurobiology, or Quantitative Biology tracks should consult an adviser for their track (listed above). The course schedules of all MCDB majors (including sophomores intending to major in MCDB) must be signed by a faculty member in the department. The signature of the DUS is required **only** for students who are fulfilling the requirements of two majors or who have been admitted to the simultaneous B.S./M.S. degree program. Students whose regular adviser is on leave can consult the office of the DUS to arrange for an alternate.

Any faculty member with a primary appointment in the MCDB department can serve as a faculty adviser to majors. College faculty advisers available to first-year students are listed below.

BF	D. Kankel	MC	H. Keshishian, T. Pollard
BK	V. Irish, J. Wolenski	MY	S. Bahmanyar, D. Clark, C. Crews, J. Gendron
BR	I. Dawson, T. Emonet, S. Hatzios, J. van Wolfswinkel, D. Breslow	PC	J. Carlson, V. Horsley, N. Dimitrova
DC	S. Dellaporta, P. Forscher, W. Zhong	SM	J. Rosenbaum
ES	M. Acar	SY	C. Jacobs-Wagner, S. Lin
GH	M. Mooseker, R. Wyman	TC	Y. Jacob, M. Moreno
JE	R. Breaker, F. Isaacs	TD	S. Holley

Simultaneous B.S./M.S. degree program Exceptionally able and well-prepared students may accelerate their professional education by completing a course of study leading to the simultaneous award of the B.S. and M.S. degrees after eight terms of enrollment. Students may not enroll in Yale College for more than eight terms in

order to qualify for the simultaneous award of both degrees. It is possible to earn both degrees in fewer than eight terms, but not by the use of acceleration credits. The requirements are as follows:

1. Candidates must satisfy the Yale College requirements for the B.S. degree. Students in the program must complete the core courses for the major and choose their 4 electives from graduate-level courses. One of the electives must be a graduate seminar selected with the approval of the DUS. Grades below B- in graduate courses are not accepted.
2. In addition to the courses specified above, students must complete two graduate research courses for six course credits: (a) MCDB 585, a two-credit course taken in the second term of the junior year. At the start of the course, each student forms a committee comprised of the faculty adviser and two faculty members that meets to discuss the research project. Two of the members of this committee must be members of the MCDB faculty. At the end of the course, the student completes a detailed prospectus describing the thesis project and the work completed to date. The committee evaluates an oral and written presentation of the prospectus and determines whether the student may continue in the combined program; (b) MCDB 595, 596, a four-credit, yearlong course that is similar to MCDB 495, 496 and is taken during the senior year. During the course, the student gives an oral presentation describing the work. At the end of the course, the student is expected to present his or her work to the department in the form of a poster presentation. In addition, the student is expected to give an oral thesis defense, followed by a comprehensive examination of the thesis conducted by the thesis committee. Upon successful completion of this examination, as well as all other requirements, the student is awarded the combined B.S./M.S. degree.

Students must also satisfy the requirements of Yale College for the simultaneous award of the bachelor's and master's degrees, including the following:

1. To be considered for admission to the program, by the end of their fifth term of enrollment students must have achieved at least two-thirds A or A- grades in all of their courses as well as in all of the courses directly relating to the major, including prerequisites.
2. Students must apply in writing to the DUS and obtain departmental approval no later than the last day of classes in their fifth term of enrollment in Yale College.
3. Students must have the approval of both the DUS and the director of graduate studies to receive graduate credit for the graduate courses they select.
4. Graduate work must not be entirely concentrated in the final two terms, and students in the program must take at least six term courses outside the department during their last four terms at Yale and at least two undergraduate courses during their last two terms.
5. Students must earn grades of A in at least two of their graduate-level term courses (or in one yearlong course) and have at least a B average in the remaining ones.

For more information, see Academic Regulations, section K, Special Arrangements, "Simultaneous Award of the Bachelor's and Master's Degrees."

STUDY ABROAD

Some programs for study abroad are available to MCDB majors; approved programs can fulfill some of the requirements for the major. Interested students should consult the DUS and the Center for International and Professional Experience.

REQUIREMENTS OF THE MAJOR

Prerequisites *B.A.* – BIOL 101, 102, 103, 104; a two-term lecture sequence in chem; one term of PHYS 170 or above; MATH 115 or above or a Yale S&DS course; *B.S.* – same as for the *B.A.* degree, in addition to labs associated with a two-term lecture sequence in chem; 1 term of organic chem with lab; two terms of physics, PHYS 170 or above

Number of courses *B.A.* – 5 courses and 1 lab, totaling at least 5½ course credits beyond the prereqs; *B.S.* – 8 courses and 2 labs, totaling at least 9 course credits beyond the prereqs; *B.S., intensive major* – 8 courses and 2 labs, totaling at least 11 course credits beyond prereqs and inc senior req; all courses taken for letter grades

Specific courses required *Biotechnology track* – MCDB 370; *Neurobiology track* – MCDB 320; *Quantitative Biology track* – MCDB 330

Distribution of courses *Standard track* – *B.A.* – 2 core courses from MCDB 200, 202, 205, 210, 290, 300 (or MB&B 300); 2 electives numbered MCDB 250 or above (or 2 addtl core courses); 1 elective numbered MCDB 350 or above; 1 biology lab; *B.S.* – 3 core courses from MCDB 200, 202, 205, 210, 290, 300 (or MB&B 300); 2 electives numbered MCDB 250 or above (or 2 addtl core courses); 1 elective numbered MCDB 350 or above; 2 MCDB labs; *Biotechnology, Neurobiology, and Quantitative Biology tracks* – same as standard track, with a specific req (track dependent) in place of one of the general electives, as specified

Senior requirement *B.A.* – MCDB 475 taken in senior year, or senior essay; *B.S.* – 2 consecutive terms of independent research, MCDB 485, 486 (preferred) or 2 consecutive terms of MCDB 475; *B.S., intensive major* – MCDB 495, 496 in senior year

FACULTY OF THE DEPARTMENT OF MOLECULAR, CELLULAR, AND DEVELOPMENTAL BIOLOGY

Professors Ronald Breaker, John Carlson, †Lynn Cooley, Craig Crews, Stephen Dellaporta, Paul Forscher, †Mark Hochstrasser, Scott Holley, Vivian Irish, †Akiko Iwasaki, Christine Jacobs-Wagner, Douglas Kankel, †Paula Kavathas, Haig Keshishian, Mark Mooseker, Thomas Pollard, Anna Pyle, Joel Rosenbaum, †Alanna Schepartz, †Hugh Taylor, Robert Wyman

Associate Professors Murat Acar, †Sreeganga Chandra, Damon Clark, Thierry Emonet, Valerie Horsley, †Megan King, Farren Isaacs, †Kathryn Miller-Jensen, †Matthew Rodeheffer, Weimin Zhong

Assistant Professors Shirin Bahmanyar, David Breslow, Nadya Dimitrova, Joshua Gendron, Stavroula Hatzios, Yannick Jacob, Josien van Wolfswinkel

Professor Adjunct Robert Bazell

Lecturers †Alexia Belperron, †Surjit Chandhoke, Iain Dawson, Samantha Lin, Maria Moreno, Kenneth Nelson, Julie Park, †Aruna Pawashe, Joseph Wolenski

†A secondary appointment with primary affiliation in another department or school.

Introductory Courses

* **MCDB 040b, The Science and Politics of Cancer** Robert Bazell

Fundamentals of cell biology, Darwinian evolution, immunology, and genetics that underlie cancer; the history of cancer science and treatment; historical and current policy issues. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SC

* **MCDB 050a, Immunology and Microbes** Paula Kavathas

Introduction to the immune system and its interaction with specific microbes. Attention both to microbes that cause illness, such as influenza, HIV, and HPV, and to microbes that live in harmony with humans, collectively called the microbiome. Readings include novels and historical works on diseases such as polio and AIDS. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program.

SC RP

* **MCDB 065a, The Science and Politics of HIV/AIDS** Robert Bazell

Study of the basic virology and immunology of HIV/AIDS, along with its extraordinary historical and social effects. Issues include the threat of new epidemics emerging from a changing global environment; the potential harm of conspiracy theories based on false science; and how stigmas associated with poverty, gender inequality, sexual preference, and race facilitate an ongoing epidemic. For all first-year students regardless of whether they are considering a science major. Prerequisite: AP Biology or equivalent. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SC

* **MCDB 103b, Cancer** Alexia Belperron

Introduction to the biology of cancer, with a focus on the genetic basis of cancer, the role carcinogens, genetics and infectious diseases play in the development of cancer, the role of the immune system in controlling cancer and how it can be harnessed in new novel treatments, the basic biochemistry behind chemotherapy, and the basic biology behind preventative strategies. Intended for non-science majors and underclassmen. High school biology required. SC

MCDB 105a or b / MB&B 105a or b, Biology, the World, and Us Staff

Biological concepts taught in context of current societal issues, such as emerging diseases, genetically modified organisms, green energy, and the human brain and its disorders. Emphasis on biological literacy to enable students to evaluate scientific arguments. SC

* **MCDB 106a / E&EB 106a / HLTH 155a, Biology of Malaria, Lyme, and Other Vector-Borne Diseases** Alexia Belperron

Introduction to the biology of pathogen transmission from one organism to another by insects; special focus on malaria, dengue, and Lyme disease. Biology of the pathogens including modes of transmission, establishment of infection, and immune responses; the challenges associated with vector control, prevention, development of vaccines, and treatments. Intended for non-science majors; preference to freshmen and sophomores. Prerequisite: high school biology. SC

* **MCDB 109b, Immunity and Contagion** Paula Kavathas

Introduction to the basics of the immune system; strategies to fight pathogens while maintaining harmony with our microbiome. Discussion of specific microbes such

as influenza, HIV, and HPV; historical analysis of the polio vaccine and the AIDS epidemic. Enrollment limited to freshmen and sophomores. SC

* **MCDB 175Lb, Exploring the Microbial World** Iain Dawson

This course is designed to provide an immersive, introductory biology lab for first years and sophomores. Students conduct semester long projects to develop methods and tools to study the growth patterns of an unusual filamentous bacteria, *Bacillus mycoides*. Biol 101-104 is a co- or-prerequisite. Restricted to first year and sophomore students. Preference given to students with no prior research experience. Instructor permission required. SC ½ Course cr

Intermediate and Advanced Courses

MCDB 200b, Molecular Biology Anna Pyle and Farren Isaacs

A study of the fundamental principles of molecular biology, including the experimental methodologies used in biological research. Topics include the structure, function, and chemical behavior of biological macromolecules (DNA, RNA, and protein), chromosome and genome organization, replication and maintenance of the genome, transcriptional and translational regulation, microRNAs and other noncoding RNAs, RNA processing, systems biology, and synthetic biology. Designed to provide an accelerated venue for MCDB majors and other students seeking to understand the molecular basis for gene expression and the resultant implications for medicine and biological engineering. Prerequisites: CHEM 161, 165, or 167 (or CHEM 112, 114, or 118), and BIOL 101 or permission of instructor. SC

* **MCDB 201Lb, Molecular Biology Laboratory** Maria Moreno

Basic molecular biology training in a project-based laboratory setting. Experiments analyze gene function through techniques of PCR, plasmid and cDNA cloning, DNA sequence analysis, and protein expression and purification. Instruction in experimental design, data analysis, and interpretation. Concurrently with or after MCDB 200, or with permission from instructor. For freshmen and sophomores interested in research integrated laboratory experience. Special registration procedures apply. Interested students must contact the instructor and attend an organizational meeting during the first week of classes. WR, SC ½ Course cr

* **MCDB 202a, Genetics** Stephen Dellaporta and Joshua Gendron

An introduction to classical, molecular, and population genetics of both prokaryotes and eukaryotes and their central importance in biological sciences. Emphasis on analytical approaches and techniques of genetics used to investigate mechanisms of heredity and variation. Topics include transmission genetics, cytogenetics, DNA structure and function, recombination, gene mutation, selection, and recombinant DNA technology. Prerequisite: BIOL 103 or equivalent performance on the corresponding biological sciences placement examination. SC RP

* **MCDB 203La, Laboratory for Genetics** Iain Dawson

Introduction to laboratory techniques used in genetic analysis. Genetic model organisms – bacteria, yeast, *Drosophila*, and *Arabidopsis* – are used to provide practical experience with various classical and molecular genetic techniques including cytogenetics; complementation, epistasis, and genetic suppressors; mutagenesis and mutant analysis, recombination and gene mapping, isolation and manipulation of

DNA, and transformation of model organisms. Concurrently with or after MCDB 202.
SC ½ Course cr

MCDB 205b, Cell Biology Thomas Pollard, Megan King, Shirin Bahmanyar, and David Breslow

A comprehensive introductory course in cell biology. Emphasis on the general principles that explain the molecular mechanisms of cellular function. Prerequisites: BIOL 101 and 102, or equivalent performance on the corresponding biological sciences placement examinations, or a score of 5 on the Advanced Placement test in Biology, or a score of 710 or above on the SAT Biology M test, or MCDB 200. SC

MCDB 210a, Developmental Biology Scott Holley and Douglas Kankel

A survey of the molecular and genetic control of embryonic development, cell-cell communication, and cell differentiation. Emphasis on mechanistic investigation in model organisms that reveal fundamental concepts explaining human birth defects and disease. Topics include gastrulation; neural and mesoderm induction; limb development; heart and vascular development; craniofacial development; adult and embryonic stem cells; regeneration; evolution and development. Prerequisites: BIOL 101, 102, and 103, or equivalent performance on the corresponding biological sciences placement examinations. SC

MCDB 221La, Model Organisms in Biological Research Maria Moreno

An introduction to research and common methodologies in the biological sciences, with emphasis on the utility of model organisms. Techniques and methods commonly used in biochemistry, cell biology, genetics, and molecular and developmental biology; experimental design; data analysis and display; scientific writing. With permission of instructor or concurrently with or after BIOL 101, 102 or 103. WR, SC ½ Course cr

MCDB 250b, Biology of Reproduction Hugh Taylor and Seth Guller

Introduction to reproductive biology, with emphasis on human reproduction. Development and hormonal regulation of reproductive systems; sexuality, fertilization, and pregnancy; modern diagnosis and treatment of reproductive and developmental disorders; social and ethical issues. BIOL 101, 102, and 103, or equivalent performance on the corresponding biological sciences placement examinations, or a score of 5 on the Advanced Placement test in Biology, or a score of 710 or above on the SAT Biology M test SC

MCDB 251Lb, Laboratory for Biology of Reproduction and Development Seth Guller, Hugh Taylor, and Shannon Whirledge

Laboratory focus on aspects of human reproductive biology and connections with normal reproductive outcomes. Clinically relevant consideration of human tissue and cell models to study ovarian, uterine, and placental structure and function. Testing of the role of tissue specific cellular differentiation; human trophoblast function; and the roles of steroid hormones in the regulation of uterine, placental, and ovarian function. Mouse tissue models will be employed. Enrollment limited. Concurrently with or after MCDB 210 or 250. Not open to first-year students. Special registration procedures apply; students must consult the instructor prior to the first week of classes.
SC ½ Course cr

MCDB 290b, Microbiology John Wertz and Murat Acar

Cell structure of bacteria, bacterial genetics, microbial evolution and diversity, bacterial development, microbial interaction, chemotaxis and motility, gene regulation, microbial

genomics and proteomics, CRISPR, metabolism, infectious diseases, mechanisms of pathogenesis, host defense systems, viruses, gut microbiota in health and disease. Prerequisites: BIOL 101, 102, and 103, or equivalent performance on the corresponding biological sciences placement examinations; or one term of biochemistry, or cell biology, or genetics; or with permission of instructor. SC

*** MCDB 291Lb, Laboratory for Microbiology** Iain Dawson

Practical approaches used when working with microbes, primarily bacteria. Topics include microscopy, culture techniques, biochemical/metabolic assays, and basic environmental and medical microbiology. Concurrently with or after MCDB 290. Electronic permission key required; students should contact the instructor prior to the first class meeting. SC ½ Course cr

*** MCDB 300a / MB&B 200a, Biochemistry** Ronald Breaker and Donald Engelman

An introduction to the biochemistry of animals, plants, and microorganisms, emphasizing the relations of chemical principles and structure to the evolution and regulation of living systems. Prerequisites: BIOL 101 or equivalent performance on the corresponding biological sciences placement examination; one term of organic chemistry; or with permission of instructor. SC

*** MCDB 301La or b / MB&B 251La or b, Laboratory for Biochemistry** Aruna Pawashe and Staff

An introduction to current experimental methods in molecular biology, biophysics, and biochemistry. Limited enrollment. Requires preregistration by e-mail to aruna.pawashe@yale.edu and william.konigsberg@yale.edu prior to the first week of classes. Please note: During the fall term, this course runs as two sections, Tuesday or Thursday from 1.15pm–5.15pm, for the entire semester. During the spring term it meets twice a week, Tuesday and Thursday, but only for the first half of the semester. Prerequisite: BIOL 101. SC ½ Course cr

*** MCDB 303Lb, Advanced Molecular Biology Laboratory** Maria Moreno and Kenneth Nelson

A laboratory course that provides advanced biology research skills. Weekly workshops focus on laboratory practice, experimental design, data analysis, reading of primary literature, scientific presentations, and scientific writing skills. Application of these skills in project-based laboratory training sponsored by a faculty member. Enrollment limited. Special registration procedures apply; interested students must contact the instructor and attend an organizational meeting. This class is recommended to students in the sciences who are in their junior year and will be completing a senior research project requirement for graduation. SC RP

*** MCDB 310a / BENG 350a, Physiological Systems** Mark Saltzman and Stuart Campbell

Regulation and control in biological systems, emphasizing human physiology and principles of feedback. Biomechanical properties of tissues emphasizing the structural basis of physiological control. Conversion of chemical energy into work in light of metabolic control and temperature regulation. Prerequisites: CHEM 165 or 167 (or CHEM 113 or 115), or PHYS 180 and 181; MCDB 120, or BIOL 101 and 102. SC

MCDB 315b, Pathobiology S. David Hudnall, Jon Morrow, Anita Huttner, Jeffrey Sklar, and Gilbert Moeckel

Mechanisms of human disease from a pathologic perspective. Includes sections devoted to systemic pathobiology, hematologic disease, gastrointestinal disease, renal disease, and cancer genetics. Subjects covered include cell and tissue injury, disordered physiology, inflammatory disease, and neoplastic disease. Enrollment limited; preference to junior and senior majors in MCDB or MB&B. Prerequisites: MCDB 205, 300, or 310 SC RP

MCDB 320a / NSCI 320a, Neurobiology Haig Keshishian and Paul Forscher
The excitability of the nerve cell membrane as a starting point for the study of molecular, cellular, and systems-level mechanisms underlying the generation and control of behavior. Prerequisites: year of college-level chemistry; a course in physics is strongly recommended. SC

MCDB 321La / NSCI 321La, Laboratory for Neurobiology Haig Keshishian, Robert Wyman, and Paul Forscher

Introduction to the neurosciences. Projects include the study of neuronal excitability, sensory transduction, CNS function, synaptic physiology, and neuroanatomy. Concurrently with or after MCDB 320. SC ½ Course cr

MCDB 330a / MB&B 330a / NSCI 324a, Modeling Biological Systems I Thierry Emonet and Kathryn Miller-Jensen

Study of the analytic and computational skills needed to model genetic networks and protein signaling pathways. Review of basic biochemical concepts including chemical reactions, ligand binding to receptors, cooperativity, and Michaelis-Menten enzyme kinetics. Deep exploration of biological systems including: kinetics of RNA and protein synthesis and degradation; transcription activators and repressors; lysogeny/lysis switch of lambda phage and the roles of cooperativity and feedback; network motifs such as feed-forward networks and how they shape response dynamics; cell signaling, MAP kinase networks and cell fate decisions; bacterial chemotaxis; and noise in gene expression and phenotypic variability. Students learn to model using MatLab in a series of in-class hackathons that illustrate biological examples discussed in lectures. Prerequisites: BIOL 101-104, or with permission of instructors. QR, SC

* **MCDB 342La, Laboratory in Nucleic Acids I** Kenneth Nelson

A project from a research laboratory within the MCDB department, using technologies from molecular and cell biology. Laboratories meet twice a week for the first half of the term. Concurrently with or after MCDB 202, 205, or 300. Enrollment limited. Special registration procedures apply; students should contact the instructor during January of the year you intend to take the course. SC ½ Course cr

* **MCDB 343La, Laboratory in Nucleic Acids II** Kenneth Nelson

Continuation of MCDB 342L to more advanced projects in molecular and cell biology, such as making and screening cDNA libraries, microarray screening and analysis, or next-generation DNA sequencing. Laboratories meet twice a week for the second half of the term. Enrollment limited. Special registration procedures apply; students should contact the instructor during January of the year you intend to take the course. MCDB 342L or permission of instructor. SC ½ Course cr

* **MCDB 344Lb, Experimental Techniques in Cellular Biology** Joseph Wolenski
An inquiry-based approach to research in cell and molecular biology, with emphasis on experimental techniques commonly used in modern biomedical laboratories. Research is module-based and covers pertinent and timely topics. Methods include SDS-PAGE, immunoblotting, immunoprecipitation of proteins, column chromatography, mammalian cell culture, cell fractionation, cell transfection, DNA purification, PCR, and phase contrast and confocal microscopy. Meets during January and February. Prerequisite: MCDB 205. Special registration procedures apply; interested students must contact the instructor at least eighteen months in advance. SC ½ Course cr

* **MCDB 345Lb, Experimental Strategies in Cellular Biology** Joseph Wolenski
Continuation of MCDB 344L, with increased emphasis on experimental design, independent research, presentation of data and research seminars. Students develop semi-independent research projects in modern biomedical research. Emphasis on key components of being a successful principal investigator, including benchwork, seminar presentations, lab meetings, and critical analysis of data. Prepares for MCDB 475, 485, or 495. Meets during March and April. Prerequisite: MCDB 344L. Special registration procedures apply; interested students should contact the instructor. SC ½ Course cr

* **MCDB 350a, Epigenetics** Yannick Jacob and Nadya Dimitrova
Study of epigenetic states and the various mechanisms of epigenetic regulation, including histone modification, DNA methylation, nuclear organization, and regulation by non-coding RNAs. Detailed critique of papers from primary literature and discussion of novel technologies, with specific attention to the impact of epigenetics on human health. Introductory courses (BIOL 101-104) and two MCDB 200-level courses (strongly recommended: MCDB 202 and MCDB 200 or MCDB 210) or instructor permission. SC

* **MCDB 355a, The Cytoskeleton, Associated Proteins, and Disease** Surjit Chandhoke
In-depth discussion of the cytoskeleton, proteins associated with the cytoskeleton, and diseases that implicate members of these protein families. Preference given to seniors in the MCDB major. Prerequisites: BIOL 101-104 *and* at least one MCDB 200-level course. SC

MCDB 361b / BENG 465b / MB&B 361b / NSCI 325b, Modeling Biological Systems II

Damon Clark, Thierry Emonet, and Jonathon Howard

Advanced topics related to dynamical processes in biological systems. Processes by which cells compute, count, tell time, oscillate, and generate spatial patterns. Time-dependent dynamics in regulatory, signal-transduction, and neuronal networks; fluctuations, growth, and form. Comparisons between models and experimental data. Dynamical models applied to neurons, neural systems, and cellular biophysical processes. Use of MATLAB to create models. Prerequisite: MCDB 330 or equivalent, or a 200-level biology course, or with permission of instructor. QR

* **MCDB 370b, Biotechnology** Craig Crews, Ronald Breaker, Joseph Wolenski, Kenneth Nelson, Farren Isaacs, and Yannick Jacob
The principles and applications of cellular, molecular, and chemical techniques that advance biotechnology. The most recent tools and strategies used by industrial labs, academic research, and government agencies to adapt biological and chemical compounds as medical treatments, as industrial agents, or for the further study of biological systems. Prerequisite: MCDB 200, 202, or 300. SC

* **MCDB 380a, Advances in Plant Molecular Biology** Vivian Irish, Joshua Gendron, and Yannick Jacob

The study of basic processes in plant growth and development to provide a foundation for addressing critical agricultural needs in response to a changing climate. Topics include the latest breakthroughs in plant sciences with emphasis on molecular, cellular, and developmental biology; biotic and abiotic plant interactions; development, genomics, proteomics, epigenetics and chemical biology in the context of plant biology; and the current societal debates about agrobiotechnology. Prerequisites: BIOL 101-104 and two MCDB 200-level courses, or permission of instructor. SC

* **MCDB 387a, The Eukaryotic Cell Cycle** Iain Dawson

The regulation and coordination of the eukaryotic cell cycle examined by means of a detailed critique of primary literature. Particular attention to the role of the cell cycle in the processes of development and differentiation and in cancer and other diseases. Students develop an understanding of experimental approaches to problem solving. Enrollment limited, with preference to juniors and seniors. Prerequisites: BIOL 101, 102, and 103, or equivalent performance on the corresponding biological sciences placement examinations; MCDB 202, 205, or 210. Electronic permission key required. Students must contact the instructor prior to the first class meeting. SC

* **MCDB 415b, Cellular and Molecular Physiology** Emile Boulpaep

Study of the processes that transfer molecules across membranes. Classes of molecular machines that mediate membrane transport. Emphasis on interactions among transport proteins in determining the physiologic behaviors of cells and tissues. Intended for seniors majoring in the biological sciences. Recommended preparation: MCDB 205, 310, 320, or permission of instructor. SC

* **MCDB 425a / MB&B 425a, Basic Concepts of Genetic Analysis** Jun Lu

The universal principles of genetic analysis in eukaryotes. Reading and analysis of primary papers that illustrate the best of genetic analysis in the study of various biological issues. Focus on the concepts and logic underlying modern genetic analysis. Prerequisite: MCDB 202 or pre-approval of instructor. SC

* **MCDB 430a, Biology of the Immune System** Eric Meffre, David Schatz, Peter Cresswell, Jordan Pober, Joao Pedro Pereira, Ruslan Medzhitov, Craig Roy, Nikhil Joshi, Aaron Ring, Noah Palm, Kevan Herold, Carla Rothlin, and Carrie Lucas

The development of the immune system. Cellular and molecular mechanisms of immune recognition. Effector responses against pathogens. Immunologic memory and vaccines. Human diseases including allergy, autoimmunity, immunodeficiency, and HIV/AIDS. After MCDB 300. SC

* **MCDB 435a, Landmark Papers in Cell Biology** Joel Rosenbaum and Mark Mooseker

Discussion and critical evaluation of selected research papers that were important in determining the directions of modern cell biological research. Emphasis on the nature of the problem, evaluation of the experimental approaches and results, and the authors' interpretation of the results. Grade dependent on weekly discussion by all participants. Seniors only. Students should contact the instructor prior to the first week of classes. Prerequisites: courses in cell biology, biochemistry, and genetics, or permission of instructor. SC

* **MCDB 450b, The Human Genome** Stephen Dellaporta

A focus on the primary scientific literature covering the principles of genomics and its application to the investigation of complex human traits and diseases. Topics include the technology of genome sequencing and resequencing, the characterization of sequence and structural variation in human populations, haplotype and linkage disequilibrium analysis, genome-wide association studies, the comparative genomics of humans and our closest relatives, and personalized genomics and medicine. Enrollment limited to 15. Students should contact the instructor prior to the first week of classes. Prerequisite: MCDB 202; a course in statistics is strongly recommended. SC

MCDB 452b / MB&B 452b / S&DS 352b, Biomedical Data Science, Mining and Modeling Mark Gerstein and Matthew Simon

Techniques in data mining and simulation applied to bioinformatics, the computational analysis of gene sequences, macromolecular structures, and functional genomics data on a large scale. Sequence alignment, comparative genomics and phylogenetics, biological databases, geometric analysis of protein structure, molecular-dynamics simulation, biological networks, microarray normalization, and machine-learning approaches to data integration. Prerequisites: MB&B 301 and MATH 115, or permission of instructor. SC

* **MCDB 461b, Concepts and Applications in Systems Biology** Murat Acar

Analysis of the primary scientific literature on the topics of gene network design, stochasticity in gene expression, and evolution of genes and networks, in the context of both prokaryotic and eukaryotic systems. Critique of the approaches, data analysis, controls, results, and conclusions of selected current and classic papers in systems biology. Prerequisite: MCDB 261 or 361, or another MCDB course with permission of instructor. SC

* **MCDB 474a or b, Independent Research** Joseph Wolenski and Staff

Research project under faculty supervision taken Pass/Fail. This is the only independent research course available to underclassmen. Students are expected to spend approximately ten hours per week in the laboratory. To register, the student must submit a form, which is available at <http://mcdB.yale.edu/forms> as well as on the course site on Canvas@Yale, and a written plan of study with bibliography, approved by the faculty research adviser. The form and proposal must be uploaded to Canvas@Yale by the end of the second week of classes. A final research report is required at the end of the term. Students who take this course more than once must reapply each term. Guidelines for the course should be obtained from the office of the director of undergraduate studies or downloaded from the Canvas@Yale server.

* **MCDB 475a or b, Senior Independent Research** Joseph Wolenski and Staff

Research project under faculty supervision, ordinarily taken to fulfill the senior requirement. This course is only available to MCDB seniors and they are awarded a letter grade. Students are expected to spend approximately ten hours per week in the laboratory. To register, the student must prepare a form, which is available at <http://mcdB.yale.edu/forms> as well as on the course site on Canvas@Yale, and a written plan of study with bibliography, approved by the faculty research adviser. The form and proposal must be uploaded to Canvas@Yale by the end of the second week of classes. The final research paper is due in the hands of the sponsoring faculty member, with a copy uploaded to Canvas@Yale, by the last day of classes. Students who take this course more than once must reapply each term; students planning to conduct two

terms of research should consider enrolling in MCDB 485, 486. Students should line up a research laboratory during the term preceding the research. Fulfills the senior requirement for the B.A. degree if taken in the senior year. Two consecutive terms of this course fulfill the senior requirement for the B.S. degree if at least one term is taken in the senior year.

*** MCDB 482a, Advanced Seminar in Cell Biology: Intracellular Signal Transduction**

Craig Crews

Discussion of intracellular signal transduction pathways. Detailed critique of experimental approaches, controls, results, and conclusions of selected current and classic papers in this field. SC

*** MCDB 485a and MCDB 486b, Senior Research** Joseph Wolenski and David Breslow

Individual two-term laboratory research projects under the supervision of a faculty member. For MCDB seniors only. Students are expected to spend ten to twelve hours per week in the laboratory, and to make presentations to students and advisers. Written assignments include a short research proposal summary due at the beginning of the first term, a grant proposal due at the end of the first term, and a research report summarizing experimental results due at the end of the second term. Students are also required to present their research in either the fall or the spring term. A poster session is held at the end of the spring term. Students should line up a research laboratory during the term preceding the research. Guidelines for the course may be obtained at <http://mcdb.yale.edu/forms> and on the course site on Canvas@Yale. Written proposals are due by the end of the second week of classes. Fulfills the senior requirement for the B.S. degree if taken in the senior year.

*** MCDB 486b, Senior Research** Joseph Wolenski

Individual two-term laboratory research projects under the supervision of a faculty member. For MCDB seniors only. Students are expected to spend ten to twelve hours per week in the laboratory, and to make presentations to students and advisers. Written assignments include a short research proposal summary due at the beginning of the first term, a grant proposal due at the end of the first term, and a research report summarizing experimental results due at the end of the second term. Students are also required to present their research in either the fall or the spring term. A poster session is held at the end of the spring term. Students should line up a research laboratory during the term preceding the research. Guidelines for the course may be obtained at <http://mcdb.yale.edu/forms> and on the course site on Classes*v2. Written proposals are due by the end of the second week of classes. Fulfills the senior requirement for the B.S. degree if taken in the senior year.

*** MCDB 495a and MCDB 496b, Senior Research Intensive** Joseph Wolenski and

David Breslow

Individual two-term directed research projects in the field of biology under the supervision of a faculty member. For MCDB seniors only. Before registering, the student must be accepted by a Yale faculty member with a research program in experimental biology and obtain the approval of the instructor in charge of the course. Students spend approximately twenty hours per week in the laboratory, and make written and oral presentations of their research to students and advisers. Written assignments include a short research proposal summary due at the beginning of the first term, a grant proposal due at the end of the first term, and a research report summarizing experimental results due at the end of the second term. Students must

attend a minimum of three research seminar sessions (including their own) per term. Students are also required to present their research during both the fall and spring terms. A poster session is held at the end of the spring term. Guidelines for the course may be obtained at <http://mcdb.yale.edu/forms> and on the course site on Canvas@Yale. Written proposals are due by the end of the second week of classes. Fulfills the senior requirement for the B.S. degree with an intensive major. 2 Course cr per term

*** MCDB 496b, Senior Research Intensive** Joseph Wolenski

Individual two-term directed research projects in the field of biology under the supervision of a faculty member. For MCDB seniors only. Before registering, the student must be accepted by a Yale faculty member with a research program in experimental biology and obtain the approval of the instructor in charge of the course. Students spend approximately twenty hours per week in the laboratory, and make written and oral presentations of their research to students and advisers. Written assignments include a short research proposal summary due at the beginning of the first term, a grant proposal due at the end of the first term, and a research report summarizing experimental results due at the end of the second term. Students must attend a minimum of three research seminar sessions (including their own) per term. Students are also required to present their research during both the fall and spring terms. A poster session is held at the end of the spring term. Guidelines for the course may be obtained at <http://mcdb.yale.edu/forms> and on the course site on Classes*v2. Written proposals are due by the end of the second week of classes. Fulfills the senior requirement for the B.S. degree with an intensive major. 2 Course cr

Music

Director of undergraduate studies: Anna Zayaruznaya (anna.zayaruznaya@yale.edu), 205 STOECK, 432-2996; yalemusic.yale.edu

The Department of Music offers introductory and advanced instruction in the history of music, the theory of music, composition, music technology, and performance. The Music major provides a general music program in the humanities, as well as preparation for graduate studies or for careers in music.

COURSES FOR NONMAJORS AND MAJORS

Introductory courses, numbered from 100 to 199, are open to all undergraduates and require no previous experience in music.

Qualified students, whether majoring in music or not, may offer up to four terms of instruction in performance for academic credit toward the 36-course-credit requirement for the bachelor's degree. Of these four course credits, only two may be applied to the major in Music. Auditions for lessons are held at the beginning of the fall term; students sign up at the School of Music auditions website. Students who audition for lessons are placed into one of three groups: (1) noncredit instruction for a fee; (2) lessons for academic credit at the intermediate level (MUSI 345), graded Pass/Fail; or (3) lessons for academic credit at the advanced level (MUSI 445), graded A–F. Only students with exceptional proficiency are placed into MUSI 445.

Students accepted for noncredit instruction are charged \$550 for ten hours of lessons per term or \$350 for six hours of lessons per term. The fees are added to the Student Financial Services bill and are not refundable after the first two weeks of lessons each term. Declared music majors in their junior or senior year may receive noncredit lessons at a discounted rate: six hours of lessons per term at no charge or ten hours of lessons per term for \$275.

COURSE NUMBERING

Introductory courses are numbered from 100 to 199. Intermediate courses, numbered between 200 and 399, may require prerequisites or a familiarity with music notation. Advanced courses, numbered between 400 and 494, are intended for students who have completed intermediate courses in the relevant field. They are intended primarily for students majoring in music, but they may be elected by others who meet the stated prerequisites.

COREQUISITES AND LESSONS

Students taking MUSI 345 or 445 are required to enroll concurrently in an introductory or intermediate music theory or musicianship course (MUSI 100, 110, 200, 210, 211, 218, or 219) for two terms, or they must complete one term of the theory/musicianship requirement before enrolling in MUSI 345 or 445 for the first time, and another before enrolling in MUSI 345 or 445 again. MUSI 345 is taken Pass/Fail; MUSI 445 and the corequisites are taken for a letter grade.

PLACEMENT PROCEDURES

Students must take the Music Department's music theory placement test to determine their placement in the theory/musicianship sequences. Advanced Placement test scores

do not satisfy the music theory prerequisites for performance instruction. Although the faculty of the School of Music attempts to accommodate those who qualify for credit instruction, it cannot guarantee that they will be enrolled with the teacher of their choice.

REQUIREMENTS OF THE MAJOR

The major for the Class of 2020 With the approval of the director of undergraduate studies (DUS), the following changes to the requirements of the major may be fulfilled by students who declared their major under previous requirements.

The major for the Class of 2021 and subsequent classes Thirteen courses are required, two intermediate courses and one advanced course in each of four groups, and the senior requirement. Group I (MUSI 200–219; 300–319; 400–419) includes music theory and technology courses focused on the materials and structures of musical works and repertoires. Group II (MUSI 220–249; 320–349; 420–449) includes composition, technology, and performance courses with a practical focus on techniques of artistic production. Group III (MUSI 250–274; 350–374; 450–474) includes lectures and seminars taking a research- and writing-based approach to the Western art-music tradition. Group IV (MUSI 275–299; 375–399; 475–494) includes lectures and seminars taking a research- and writing-based approach to popular or vernacular music or to music of non-Western traditions.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

SENIOR REQUIREMENT

Each student majoring in Music must satisfy the senior requirement by completing a senior essay, composition, or recital in MUSI 496, 497, 498, or 499.

The standard major Students must submit a completed Senior Project Form to the DUS by the end of the course selection period in the term during which the project will be completed. The Senior Project Form, available in the departmental office, includes a brief description of the project and a timeline for completion. The form must be signed by the project's primary and secondary advisers, at least one of whom is a member of the faculty of the Department of Music.

The intensive major The intensive major is for students of high standing who are qualified to do sustained independent and original work in music research or in composition. Students wishing to elect the intensive major must register for the senior project in the fall term of their senior year (MUSI 497–499). A plan for progress must be included in the project proposal at the beginning of the fall term, specifying a deliverable end-of-term product with approximately the same scope as a one-term senior project. Upon satisfactory completion of this work, a student may be admitted to the intensive major, which consists of a second term of registration for the senior project (MUSI 497–499). The additional course for the intensive major is supplementary to the thirteen term courses that constitute the standard major.

ADVISING

Simultaneous B.A./M.A. program Undergraduates with exceptionally strong preparation in music history or music theory may complete a course of study leading to the simultaneous award of the B.A. and M.A. degrees after eight terms of enrollment.

Students may not enroll in Yale College for more than eight terms to qualify for the simultaneous award of both degrees. Declared majors in Music may apply for the program until the last day of classes in their fifth term of enrollment, if they have completed at least two graduate courses in the Department of Music, at least one numbered 700 or higher, with grades of B+ or above, and if their overall grade average is A- or above. Applicants must demonstrate progress toward proficiency in a foreign language examined by the Department of Music.

Students in the simultaneous program fulfill the requirements for the intensive major in Music. They also take eight graduate courses in the Department of Music, with average grades of B+ or higher and grades of A or A- in at least two of the courses. They satisfy the Yale College requirements for the program (see Academic Regulations, section K, Special Programs, "Simultaneous Award of the Bachelor's and Master's Degrees"), and they pass a departmental examination in a modern foreign language.

B.A./M.M. program The Bachelor of Arts/Master of Music program is designed for students with outstanding abilities in performance who are also interested in a liberal arts education. Admission to the B.A./M.M. program is through acceptance into Yale College as well as a separate, successful audition through the School of Music, either before matriculation into Yale College or during the third year of the B.A. program. For details regarding the B.A./M.M. program, please consult the Yale School of Music Bulletin.

Students cannot accelerate the undergraduate program in the B.A./M.M. program. Students in the Class of 2022 and prior class years may fulfill the Yale College requirements that were in place when they were accepted into the B.A./M.M. program.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 13 term courses numbered 200 or above (incl senior req)

Specific courses required None

Distribution of courses 2 intermediate courses and 1 advanced course from each group I-IV

Senior requirement One-term senior essay, composition, or recital in MUSI 496-499

Intensive major Two-term senior essay or project in MUSI 497-499; additional course is supplementary to the thirteen course req

FACULTY OF THE DEPARTMENT OF MUSIC

Professors Kathryn Alexander (*Adjunct*), Richard Cohn, Michael Friedmann (*Adjunct*), Daniel Harrison, Paul Hawkshaw (*Adjunct*), James Hepokoski (*Chair*), Richard Lalli (*Adjunct*), Patrick McCreless, Leon Plantinga (*Emeritus*), Ian Quinn, Ellen Rosand (*Emeritus*), Gary Tomlinson, Michael Veal

Associate Professors Robert Holzer (*Adjunct*), Brian Kane, Gundula Kreuzer, Markus Rathey (*Adjunct*), Anna Zayarnaya

Assistant Professors Konrad Kaczmarek, Henry Parkes

Lecturers Nathaniel Adam, Daniel Egan, Scott Frankel, Andrew Gerle, Grant Herreid, Maho Ishiguro, Annette Jolles, Sara Kohane, Marissa Moore, Joshua Rosenblum, Wendy Sharp

First-Year Seminar

* MUSI 035b / CPSC 035b, **Twenty-First Century Electronic and Computer Music Techniques** Scott Petersen

Exploration of twenty-first century electronic and computer music through the diverse subjects and issues at the intersection of technology and new music. How computers have changed and challenged the analysis, composition, production, and appreciation of music over the last fifty years. Knowledge of basic music theory and the ability to read Western musical notation is assumed. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program.

Introductory Courses

MUSI 100b, **Melody, Rhythm, and Notation in Global Context** Ian Quinn

This course develops skills in singing, hearing, and writing music through repertory-based case studies of improvised and written melody in global ritual song traditions. Modern Western music notation is introduced through a study of its historical development as a tool for vocal literacy. Topics include mode, scale, rhythm, meter, and form. Lectures introduce theoretical concepts in their epistemological, cultural, and historical contexts, and small-group recitation and improvisation sessions turn these concepts into musical intuitions. Principles of modal and tonal organization are introduced by modeling repertories including Vedic chant, Torah cantillation, Byzantine psalm intonation, and Carolingian chant. Interdependencies between melodic design, musical meter, and poetic prosody are explored through immersion in a repertory of folk hymnody from the Second Great Awakening, a major site of antebellum musical contact between Americans of European and African descent. Willingness to sing is essential for this course, though talent is not a prerequisite. No experience with musical notation is required.

MUSI 110a or b, **Introduction to the Elements of Music** Staff

The fundamentals of musical language (notation, rhythm, scales, keys, melodies, and chords), including writing, analysis, singing, and dictation. Intended for students who have no music reading ability.

MUSI 131a, **Introduction to the History of Western Music: 1800 to the Present**

Gundula Kreuzer

A survey of nineteenth- and twentieth-century composers, genres, and styles of music in Europe and America, with an emphasis on ways of listening. No prerequisites. HU

MUSI 180b, **History of Rock Music** Daniel Harrison

A survey of major styles, genres, and artists in popular commercial music ca. 1960–2010. Analysis of individual songs, albums, and repertories, supported by study of cultural contexts, careers and biographies, and developments in the recording industry.

HU

* MUSI 185a / THST 236a, **American Musical Theater History** Daniel Egan

Critical examination of relevance and context in the history of the American musical theater. Historical survey, including nonmusical trends, combined with text and musical analysis. WR, HU

Intermediate Courses: Group I

MUSI 200b / PHYS 118b, The Physics of Music Sarah Demers

Basic concepts in physics introduced through study of the interplay between physics and music. The mathematics of harmony; tone production by musical instruments; sound propagation through spaces such as concert halls. QR, SC

* **MUSI 210a or b, Elementary Studies in Analysis and Model Composition I** Staff

Practical investigation of the basic principles of tonal harmony, counterpoint, and composition through exercises in analysis, motivic development, phrase rhythm, texture, form, performance, and model composition. Recommended to be taken concurrently with MUSI 218 or 219. Admission after MUSI 110 or by the music theory placement test. See the *Calendar for the Opening Days* or the Music department Web site for information about the placement test. To be followed by MUSI 211. HU

* **MUSI 211a or b, Elementary Studies in Analysis and Model Composition II** Staff

Continuation of MUSI 210. Recommended to be taken concurrently with MUSI 218 or 219. Admission after MUSI 210 or by the music theory placement test. See the *Calendar for the Opening Days* or the Music department Web site for information about the placement test. HU RP

* **MUSI 218a or b, Elementary Musicianship I** Staff

Exercises in melodic and harmonic dictation, sight-singing, keyboard harmony, and aural analysis Admission after MUSI 110 or by the music theory placement test. See the *Calendar for the Opening Days* or the Music department Web site for information about the placement test RP ½ Course cr

* **MUSI 219a or b, Elementary Musicianship II** Staff

Continuation of MUSI 218. Prerequisite: MUSI 218. Recommended to be taken concurrently with MUSI 210 or 211. RP ½ Course cr

* **MUSI 318b, Intermediate Musicianship** Richard Lalli

Training in advanced aural perception, sight-singing, and keyboard skills. Prerequisite: MUSI 219 or equivalent.

Intermediate Courses: Group II

* **MUSI 220a and MUSI 221b, The Performance of Chamber Music** Wendy Sharp

Coached chamber music emphasizing the development of ensemble skills, familiarization with the repertory, and musical analysis through performance. Admission by audition only. May be repeated for credit. For audition information e-mail wendy.sharp@yale.edu. Credit for MUSI 220 only on completion of MUSI 221. ½ Course cr per term

* **MUSI 221b, The Performance of Chamber Music** Wendy Sharp

Preparing and performing chamber music works, including rehearsal techniques, leading, developing musical concepts, learning to work effectively in a small group, and performing. Weekly coaching and rehearsals, bimonthly studio classes, and end-of-term recitals. Open to qualified Yale College instrumentalists and pianists by audition only. Prerequisite: MUSI 220. May be repeated for credit. For audition information e-mail wendy.sharp@yale.edu. RP ½ Course cr

* **MUSI 222a or b, The Performance of Vocal Music** Richard Lalli

A course for singers and pianists that emphasizes the analysis and musical preparation of classical solo song and operatic repertoire. Examination of structure (poetic, harmonic, motivic), discussion of style, exploration of vocal techniques, and introduction to the International Phonetic Alphabet. Students are strongly encouraged to supplement the course with individual voice instruction. Admission by audition only. May be repeated for credit. For audition information e-mail richard.lalli@yale.edu. HU

* **MUSI 229b / THST 226b, Musical Theater Performance II** Staff

The collaborative process and its effect on musical theater performance. Choreography, music direction, and origination of new works. Analysis of texts, scripts, and taped or filmed performances; applications in students' own performance. May be repeated for credit. For audition information e-mail dan.egan@yale.edu. RP

* **MUSI 230a, Composing for Musical Theater** Joshua Rosenblum

Introduction to elements of music- and lyric-writing for theater songs. Focus on the development of compositional proficiency in the musical theater idiom and on the refinement of each student's compositional voice as composer and/or lyricist. Prerequisite: MUSI 110 or equivalent. Enrollment limited to 12. HU RP

* **MUSI 232a or b, Central Javanese Gamelan Ensemble** Maho Ishiguro

An introduction to performing the orchestral music of central Java and to the theoretical and aesthetic discourses of the gamelan tradition. Students form the nucleus of a gamelan ensemble that consists primarily of tuned gongs and metallophones; interested students may arrange for additional private instruction on more challenging instruments. The course culminates in a public performance by the ensemble. No previous musical experience required. RP

* **MUSI 233b, Cultures and Performing Arts of Central Java** Maho Ishiguro

This course explores how music and theatre traditions engage with culture, history, and tradition of performing arts in central Java with a particular focus on the role of the gamelan ensemble. Students gain first-hand experience in Javanese Wayang theater, a traditional shadow puppet performance in which the gamelan serves as a musical accompanist. This course is designed to not only give performative and practical experience of central Javanese gamelan in the traditional style, but also presents opportunities for students to examine cultural and historical aspects of the shadow puppetry tradition and gamelan music in central Java. We focus specifically on 1) the musical language and structure of central Javanese gamelan music in the context of shadow puppetry performance, 2) the historical tradition and practice of shadow puppetry, and 3) livelihood of traditional performing arts in contemporary sociocultural and religious contexts. Prerequisite: MUSI 232 or permission of the instructor.

* **MUSI 240a or b, The Performance of Early Music** Grant Herreid

A study of musical styles of the twelfth through early eighteenth centuries, including examination of manuscripts, musicological research, transcription, score preparation, and performance. Students in this class form the nucleus of the Yale Collegium Musicum and participate in a concert series at the Beinecke Library. Admission by audition only. May be repeated for credit. For audition information e-mail grant.herreid@yale.edu. HU RP

* **MUSI 320a, Composition Seminar I** Kathryn Alexander

Intermediate analytic and creative projects in music composition, instrumentation, and scoring for visual media. Study of compositional procedures and techniques in different genres and styles. Group and individual lessons to supplement in-class activities. Enrollment limited to 20. Students with questions should contact the instructor at kathryn.alexander@yale.edu. Prerequisite: MUSI 210 or 211 or equivalent. WR, HU RP

* **MUSI 321b, Composition Seminar II** Konrad Kaczmarek

Intermediate analytic and creative projects in music composition and instrumentation, with a focus on jazz harmony and voice-leading. Study of compositional procedures and techniques in different ensemble settings. Group and individual lessons to supplement in-class lectures. Enrollment limited to 20. Students with questions should contact the instructor at konrad.kaczmarek@yale.edu. Prerequisite: MUSI 210 or MUSI 211 and/or MUSI 312. RP

* **MUSI 328a, Introduction to Conducting** William Boughton

An introduction to conducting through a detailed study of the problems of baton technique. Skills applied to selected excerpts from the standard literature, including concertos, recitatives, and contemporary music.

* **MUSI 329b, Intermediate Conducting** William Boughton

Intermediate studies in baton technique and score preparation. After MUSI 323.

* **MUSI 330b, Musical Theater Composition II** Jeanine Tesori

Intermediate and advanced project-oriented studies in composition of musical theater. Prerequisite: MUSI 210. May be repeated for credit. Enrollment limited to 12. HU RP

* **MUSI 340b / THST 318b, Analyzing, Directing, and Performing Early Opera** Grant Herreid

Study of a seventeenth-century Venetian opera, with attention to structural analysis of text and music. Exploration of period performance practice, including rhetorical expression, musical style, gesture, dance, Italian elocution, and visual design. Production of the opera in conjunction with the Yale Baroque Opera Project. Open to all students, but designed especially for singers, instrumentalists, and directors. Admission by audition only. May be repeated for credit. For audition information e-mail grant.herreid@yale.edu. HU RP

* **MUSI 345a or b, Lessons** Richard Gard

Individual instruction in the study and interpretation of musical literature. No more than four credits of lessons can be applied towards the 36-credit degree requirement. Auditions for assignment to instructors (for both credit and noncredit lessons) are required for first year and some returning students, and are held only at the beginning of the fall term. For details, see the Music department's program description in the YCPS.

Intermediate Courses: Group III

* **MUSI 350a, History of Western Music: Middle Ages and Renaissance** Henry Parkes

A detailed investigation of the history of musical style from A.D. 900 to 1600. Preference to Music majors according to class. HU

* **MUSI 351b, Music in European Court, Church, and Theater, 1600-1800** Staff

A detailed investigation of the history of musical style from 1600 to 1800. Preference to Music majors according to class. HU

MUSI 370b / ART 371b, Sound Art Martin Kersels

Introduction to sound art, a contemporary artistic practice that uses sound and listening as mediums, often creating psychological or physiological reactions as part of the finished artwork. The history of sound art in relation to the larger history of art and music; theoretical underpinnings and practical production; central debates and problems in contemporary sound art. Includes creation and in-class critique of experimental works. Materials fee: \$25. HU

Intermediate Courses: Group IV**Advanced Courses: Group I*** **MUSI 418a, Advanced Musicianship** Michael Friedmann

Development of students' ability to recognize and generate structures and processes particular to music of the twentieth century. Student composers and advanced performers of post-tonal music expand their perceptive skills. Course activities include singing (and playing), dictation, identification, improvisation, and recognition. Musical examples from the works of Schoenberg, Bartók, Debussy, and Stravinsky. Enrollment limited to 14.

Advanced Courses: Group II* **MUSI 420a, Composition Seminar III** Konrad Kaczmarek

Advanced analytic and creative projects in music composition and instrumentation, with a focus on writing for chamber ensembles. Ongoing study of evolving contemporary procedures and compositional techniques. Group and individual lessons to supplement in-class lectures. Admission by audition only. May be repeated for credit. Enrollment limited to 10. To audition, students should upload two PDF scores and MP3 recordings in a single zip file by 4 p.m. on the second Wednesday of the semester, to the designated Music 420 audition assignment page at the Canvas site. Students with questions should contact the instructor at konrad.kaczmarek@yale.edu. Prerequisites: Both MUSI 312 and 313. RP

* **MUSI 421b, Composition Seminar IV** Kathryn Alexander

Advanced analytic and creative projects in music composition and instrumentation, including short exercises on scoring for performers with interactive audio and visual media playback. Individual lessons to supplement in-class lectures. Admission by audition only. May be repeated for credit. Enrollment limited to 10. To audition, students should upload two PDF scores and MP3 recordings in a single zip file by the first Friday of the semester to the designated Music 421 audition assignment page at the Canvas site. Prerequisites: Both MUSI 320 (formerly 312) and 313. RP

MUSI 427b / CPSC 432b, Computer Music: Sound Representation and Synthesis

Scott Petersen

Study of the theoretical and practical fundamentals of computer-generated music, with a focus on low-level sound representation, acoustics and sound synthesis, scales and tuning systems, and programming languages for computer music generation.

Theoretical concepts are supplemented with pragmatic issues expressed in a high-level programming language. Ability to read music is assumed. After CPSC 202 and 223. QR

MUSI 428a / CPSC 431a, Computer Music: Algorithmic and Heuristic Composition

Scott Petersen

Study of the theoretical and practical fundamentals of computer-generated music, with a focus on high-level representations of music, algorithmic and heuristic composition, and programming languages for computer music generation. Theoretical concepts are supplemented with pragmatic issues expressed in a high-level programming language. Ability to read music is assumed. After CPSC 202 and 223. QR

* **MUSI 445a or b, Advanced Lessons** Richard Gard

Individual instruction for advanced performers in the study and interpretation of musical literature. No more than four credits of lessons can be applied towards the 36-credit degree requirement. Auditions for assignment to instructors (for both credit and noncredit lessons) are required for first year and some returning students, and are held only at the beginning of the fall term. For details, see the Music department's program description in the YCPS.

* **MUSI 449a or b, Jazz Improvisation** Wayne Escoffery

In this course students study basic, intermediate, and advanced concepts of improvisation and learn the essentials for the *Jazz Language* through solo transcription and analysis. Students learn how to use vocabulary (or musical phrases) and a variety of improvisational devices and techniques over common chords and chord progressions. Upon completion of the course students have a deeper understanding of what it takes to become a great improviser, what to practice and how to practice it, and how to go about expanding their *Jazz Vocabulary* in order to naturally develop a unique improvisational voice. Students are required to bring their instruments to class. Prerequisite: Basic understanding of Jazz nomenclature and some experience improvising is advised. Admission by audition only. Permission of the instructor is required. ½ Course cr

Advanced Courses: Group III

* **MUSI 452b / EDST 478b, Music, Service, and Society** Sebastian Ruth

The role of musicians in public life, both on and off the concert stage. New ways in which institutions of music can participate in the formation of civil society and vibrant communities. The potential influence of music on the lives of people experiencing political or social oppression. HU RP

Advanced Courses: Group IV

Individual Study and Senior Projects

* **MUSI 495a or b, Individual Study** Staff

Original essay in ethnomusicology, music history, music theory, or music technology and/or multimedia art under the direction of a faculty adviser. Admission to the course upon submission to the department of the essay proposal by the registration deadline, and approval of the director of undergraduate studies.

* **MUSI 496a or b, The Senior Recital** Staff

Preparation and performance of a senior recital and accompanying essay under faculty supervision. Admission by permission of the director of undergraduate studies.

Prerequisite: MUSI 461.

* **MUSI 497a or b, The Senior Project in Composition** Staff

Preparation of a senior composition project under faculty supervision. Admission by permission of the composition faculty of the Department of Music. Prerequisites:

MUSI 312, 313, 412, and 413.

* **MUSI 498a or b, The Senior Project in Musical Theater Composition** Staff

Preparation of a senior composition project in the field of musical theater under faculty supervision. Admission by permission of the coordinator of the Shen Curriculum. Two terms of MUSI 314 or equivalent.

* **MUSI 499a or b, The Senior Essay** Staff

Preparation of a senior essay under faculty supervision. Admission by permission of the director of undergraduate studies.

Naval Science

Program adviser: Commander Adam Schlismann (adam.schlismann@yale.edu), USN, Rm. 430, 55 Whitney Ave., 432-8223; nrotc.yalecollege.yale.edu

The Naval Reserve Officers Training Corps (NROTC) program educates young men and women for service as commissioned officers in the United States Navy (USN) or Marine Corps (USMC). NROTC develops future officers mentally, morally, and physically, and instills in them the highest ideals of duty and loyalty and the core values of honor, courage, and commitment. The Naval Science program prepares students to assume the highest responsibilities of command, citizenship, and government.

ACADEMIC REQUIREMENTS

The Naval Science curriculum includes courses on topics such as Navy and Marine Corps organization, at-sea navigation, leadership, naval history, amphibious warfare, engineering, and weapons systems. Courses emphasize development of professional knowledge and leadership skills, which are placed in the context of military service immediately following graduation from Yale College.

Students in the NROTC program enroll in one Naval Science course per term. Some courses are required for both Navy and Marine option students, while others are specific to the branch of service. All NROTC students must also enroll in the Naval Science Laboratory each term.

Navy students must complete eight core curriculum courses offered by Yale College: two term courses in calculus to be completed by the sophomore year, two term courses in calculus-based physics (with laboratory) to be completed by the junior year, two term courses in English or equivalent writing courses, one term course in history or national security policy, and one term course in world culture or regional studies.

For Navy students, the usual sequence of Naval Science courses is:

First-Year	Sophomore	Junior	Senior
Introduction to Naval Science	Leadership & Management	Naval Engineering	Naval Operations
Navigation	Seapower & Maritime Affairs	Naval Systems	Leadership & Ethics

Marine students must complete three core curriculum courses offered by Yale College, including two term courses in English or equivalent writing courses, and one term course in history or national security policy.

For Marine Corps students, the usual sequence of Naval Science courses is:

First-Year	Sophomore	Junior	Senior
Introduction to Naval Science	Leadership & Management	Elective	Evolution of Warfare
Elective	Seapower & Maritime Affairs	Fundamentals of Maneuver Warfare	Leadership & Ethics

ADVISING AND APPLICATION TO THE PROGRAM

Application to the National Scholarship Program Eligible applicants must use the online application to complete and submit all the required information to apply for the NROTC scholarship. Applicants select either the Navy or Marine Corps option and scholarship recipients are appointed midshipmen in either the United States Naval Reserve (USNR) or United States Marine Corps Reserve (USMCR), as appropriate. Scholarship recipients are granted the compensation and benefits authorized by law and current policy for a total period not to exceed four years (forty months or fifty months with approved fifth year benefits). During this period, the United States government pays for college tuition, authorized academic fees, a textbook stipend, and a subsistence allowance, and provides uniforms or compensation in lieu. Upon conferral of a degree, graduates are commissioned into the Navy or Marine Corps for a minimum of five years of active duty service. Yale students who matriculate without a scholarship may apply for the National Scholarship program during the fall term of their first year.

Application to the College Program Students without a scholarship, who are in their first or second year, may apply for enrollment in the College Program and compete for two- or three-year scholarships. If selected for the two- or three-year Scholarship Program, students receive the same benefits as students in the National Scholarship Program for their remaining undergraduate studies. Upon conferral of a degree, graduates of the College Program are commissioned into the Navy or Marine Corps for a minimum of three years of active duty service. Yale students interested in the College Program may apply directly to the Yale University NROTC Unit.

FACULTY OF THE DEPARTMENT OF NAVAL SCIENCE

Professor Captain Wayne Graddock, USN (*Adjunct*)

Lecturers Lieutenant Garrett Alfstad, USN, Captain Timothy Brunstetter, USMC, Lieutenant Brandon Ordway, USN, Commander Adam Schlismann, USN, Lieutenant Brian Schoendorfer, USN

Courses

NAVY 100a or b, Naval Science Laboratory Timothy Brunstetter
Leadership and practical application skills from the Professional Core Competency objectives that are not covered in other Naval Science courses. Emphasis on professional training that is not of an academic nature. Includes both classroom instruction and physical training. Topics and special briefings as determined by Naval Science faculty and the Naval Service Training Command. Required for NROTC students each term. Receives no credit; cannot be applied toward the 36-course-credit requirement for the Yale bachelor's degree. Grades earned in this course do not count toward GPA or eligibility for General Honors. o Course cr

* **NAVY 111a, Introduction to Naval Science** Adam Schlismann

An overview of the naval service for first-year Naval ROTC students and others interested in pursuing the NROTC program. Organization, missions, customs and traditions, leadership principles, ethics, duties of a junior officer, and career options in the U.S. Navy and Marine Corps. Discussion of shipboard organization and procedures, safety, and damage control prepares students for summer training aboard naval vessels. For enrollment credit only; cannot be applied toward the 36-course-credit requirement

for the Yale bachelor's degree. Grades earned in this course do not count toward GPA or eligibility for General Honors.

*** NAVY 112b, Navigation** Brandon Ordway

Introduction to surface-ship navigation and practical piloting in both restricted and open water. Celestial navigation theory, navigational charts and instruments, and electronic navigation. Weather and other environmental factors that affect naval operations. Navigation rules and regulations, maneuvering board concepts, and practical exercises. For enrollment credit only; cannot be applied toward the 36-course-credit requirement for the Yale bachelor's degree. Grades earned in this course do not count toward GPA or eligibility for General Honors.

NAVY 211b, Leadership and Management Adam Schlismann

A study of leadership, ethics, resource management, and organizational behavior, with emphasis on situations commonly encountered by junior officers in the naval service. Classical theories of management, motivation, and communication; development of skills in organizational thinking and problem solving. Required for second-year NROTC students. For enrollment credit only; cannot be applied toward the 36-course-credit requirement for the Yale bachelor's degree. Grades earned in this course do not count toward GPA or eligibility for General Honors.

NAVY 311a, Naval Engineering Brandon Ordway

An overview of Naval engineering systems and a detailed study of the principles behind ship construction. Topics include ship design, hydrodynamic forces, stability, conventional and nuclear propulsion, electrical theory and systems, interior communications, damage control, hydraulics, and ship control. Basic concepts in the theory and design of steam, gas turbine, and diesel propulsion. For enrollment credit only; cannot be applied toward the 36-course-credit requirement for the Yale bachelor's degree. Grades earned in this course do not count toward GPA or eligibility for General Honors.

NAVY 312b, Naval Systems Quinlan Melvin

The characteristics and capabilities of the major systems and platforms used in the U.S. Navy. Technical concepts and scientific theory addressed through study of designations, characteristics, capabilities, and missions of ships and aircraft. How computers and electronic and space-based communications influence operational employment of various naval platforms. Classic theory of radar, sonar, and fire-control systems. For enrollment credit only; cannot be applied toward the 36-course-credit requirement for the Yale bachelor's degree. Grades earned in this course do not count toward GPA or eligibility for General Honors.

NAVY 411a, Naval Operations and Seamanship Quinlan Melvin

Study of relative motion, formation tactics, and ship employment. Introductions to Naval operations and operations analysis, ship behavior and characteristics in maneuvering, applied aspects of ship handling, afloat communications, Naval command and control, Naval warfare areas, and joint warfare. Analysis of case studies involving related moral, ethical, and leadership issues. Prerequisites: NAVY 111 and 112. For enrollment credit only; cannot be applied toward the 36-course-credit requirement for the Yale bachelor's degree. Grades earned in this course do not count toward GPA or eligibility for General Honors.

* **NAVY 412b, Leadership and Ethics** Wayne Grasdock

Exploration of Western moral traditions and ethical philosophy and of their applications to naval leadership in the twenty-first century. Topics include military leadership, core values, and professional ethics; the Uniform Code of Military Justice and Navy regulations; the roles of enlisted members, junior and senior officers, command relationships, and the conduct of warfare. Discussion of current and historical events in the United States Navy and Marine Corps. Prerequisite: NAVY 212. For enrollment credit only; cannot be applied toward the 36-course-credit requirement for the Yale bachelor's degree. Grades earned in this course do not count toward GPA or eligibility for General Honors.

Near Eastern Languages and Civilizations

Director of undergraduate studies: Jonas Elbousty (jonas.elbousty@yale.edu), Arnold Hall, 304 Elm Street, Room B41A, 432-2944; nelc.yale.edu

The major in Near Eastern Languages & Civilizations is an interdisciplinary liberal arts major. Students acquire language proficiency and skills in critical analysis in order to study the long-lived and rich civilizations of the Near East, ranging from ancient Mesopotamia and Egypt, to the medieval Near East and classical Islam, to modern cultures represented by modern Arabic, Hebrew, Persian, and Turkish.

The Near East is studied for its own intrinsic literary, historic, and artistic interest, as well as its cultural and historical legacies, while also providing new ways of understanding developments and challenges in the modern world. Majors go on to careers in government, foreign service, law, medicine, education, and academic research. The major also provides an excellent basis for graduate study.

REQUIREMENTS OF THE MAJOR

The major for the Class of 2020 With the approval of the director of undergraduate studies (DUS), the following changes to the requirements of the major may be fulfilled by students who declared their major under previous requirements.

The major for the Class of 2021 and subsequent classes The Near Eastern Languages and Civilizations major has two tracks from which students may choose. In track A, students focus in depth on a particular language, civilization, period, or region. In track B, students focus on Near Eastern languages and civilizations more broadly and comparatively.

Twelve term courses in the department, or their equivalent, are required for the major, including the senior essay course. There are no prerequisites. Students develop coherent programs of study in one of two tracks:

Track A, Language and Civilization (depth) offers students a rigorous and intellectually coherent foundation in line with their own specific interests. Through in-depth study of Near Eastern languages and texts in their original languages, richly contextualized through study of literature, religion, visual arts, archaeology, political and social history, students focus on the ancient Near East, the classical Near East, medieval Islam, or modern Hebrew language and culture. Requirements include: six term courses of one or two Near Eastern languages; one NELC Foundations course; four electives, chosen in consultation with the DUS and assigned faculty adviser; and the senior essay.

Track B, Languages, Civilization, and Culture (breadth) provides students the opportunity to study the Near East in its historical and cultural breadth, and to explore its rich and long-lived civilizations and cultures. This flexible program allows students to take a range of classes and to design their course of study in line with their interests. Areas of interest include languages, literature, history, religion, art and archaeology, and philosophy. Requirements include four term courses of one or more languages; two NELC Foundations courses; and five electives, including one on the ancient Near East, one on the medieval Near East, and one on the modern Middle East, chosen in consultation with the DUS and assigned faculty adviser; and the senior essay.

All students are also encouraged to take related courses in other departments and programs, such as Anthropology, Archaeology, Classics, History, History of Art, History of Science, Medicine & Public Health, Judaic Studies, Literature, Philosophy, and Religious Studies. Such courses, including college seminars, will routinely be accepted for credit toward the major if they deal with Near Eastern topics, at the discretion of the assigned faculty adviser and the DUS.

SENIOR REQUIREMENT

The senior essay is a research paper of at least thirty pages prepared under the supervision of a departmental faculty member. It may be written under the rubric of NELC 492 and/or 493, or as an extended seminar paper in a departmental seminar course, in which case the instructor serves as the essay adviser. The topic and a prospectus signed by an adviser are to be submitted to the DUS by the end of the fourth week of classes in either term of the senior year. The particular subject matter and theoretical approach of the essay are decided by the student after consultation with the faculty adviser.

In cases in which students demonstrably need more time for an extended research paper, the senior essay may be approved as a yearlong course after consultation with the adviser and the DUS. Only those students who have advanced language skills and whose project is considered to be of exceptional promise are eligible. The requirements for the two-term essay are the same as for the one-term essay, except that the essay should be at least sixty pages.

ADVISING

All course schedules must be discussed with the assigned faculty adviser and approved by the DUS.

Languages currently offered by the Department of Near Eastern Languages & Civilizations include Akkadian, Arabic, Armenian, Egyptian, Hebrew, Ottoman Turkish, Persian, Syriac, and Turkish. Students who take a foreign language during a term, year, or summer abroad must complete a departmental placement examination after they return to Yale; there are no exceptions to this requirement.

Well-qualified students who have acquired the requisite background in undergraduate courses may, with the permission of the instructor, the DUS, and the director of graduate studies, be admitted to graduate courses where no suitable undergraduate courses exist.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 12 term courses (incl senior essay)

Distribution of courses *Language and Civilization track A (depth)*—6 term courses of up to 2 Near Eastern language courses; 1 Foundations course; and 4 electives, with DUS consultation; *Languages, Civilization, and Culture track B (breadth)*—4 term courses of 1 or more Near Eastern language courses; 2 Foundations courses; 5 electives to include 1 ancient, 1 medieval, and 1 modern course, with DUS consultation

Senior requirement Senior essay in NELC 492 and/or 493 or in dept seminar

CERTIFICATE OF ADVANCED LANGUAGE STUDY

The Department of Near Eastern Languages and Civilizations offers a Certificate of Advanced Language Study in Arabic and Hebrew. A certificate adviser, typically the director of undergraduate studies (DUS), advises students on the certification process and certifies to the University Registrar's Office that students have completed the stated requirements before the end of eight terms of study. The Certificate of Advanced Language Study, once certified, is listed on student transcripts.

REQUIREMENTS

Students seeking to earn the certificate are required to take four courses beyond the L4 level in their chosen language, at least two of which must be Yale courses designated as L5. All courses must be taken for a letter grade, and students must achieve a grade of B or above. With the approval of the adviser, one advanced non-L5 Yale course, conducted in the target language, such as an independent study course, a graduate seminar, or an advanced seminar may count toward certification requirements.

The certificate adviser may allow one "language across the curriculum" (LxC) course, which ordinarily is an advanced seminar with an additional weekly discussion section in the target language, to count toward the certification requirements.

The certificate adviser may also approve the substitution of up to two credits earned during study abroad and taught in the target language to count toward the certificate requirements. If the adviser approves courses taken outside of Yale for inclusion in the certificate requirements, students must take the necessary steps to ensure those courses appear on their transcript.

Hebrew specific requirements The two required L5 courses must be modern Hebrew courses that include a speaking component.

Credit/D/Fail No courses taken Credit/D/Fail may be counted toward the requirements of the certificate.

FACULTY OF THE DEPARTMENT OF NEAR EASTERN LANGUAGES AND CIVILIZATIONS

Professors John Darnell, Benjamin Foster, Eckart Frahm, Dimitri Gutas (*Emeritus*), Bentley Layton (*Emeritus*), Shawkat Toorawa, Kevin Van Bladel, Harvey Weiss

Senior Lectors and Senior Lecturers Sarab Al Ani, Muhammad Aziz, Jonas Elbousty, Shiri Goren, Dina Roginsky, Farkhondeh Shayesteh, Kathryn Slanski

Lectors and Lecturers Julien Cooper, Ozgen Felek, Christina Geisen, Agnete Lassen, Selim Tiryakiol, Klaus Wagenonner, Orit Yeret

First-Year Seminars

* **NELC 001b / AFST 001b / ARCG 001b, Egypt and Northeast Africa: A Multidisciplinary Approach** John Darnell

An introduction to Egyptology, examining approximately 10,000 years of Nile Valley cultural records and 3,000 years of Egyptian history. The course presents an overview of the historical and archaeological study of Egypt and her southern neighbor Nubia. Various original written and visual sources are used, including the collections

of the Peabody Museum and the Yale Art Gallery, with some material accessible in the classroom. Students gain a basic understanding of the hieroglyphic script and the Ancient Egyptian language, and are able to read some inscriptions in museum visits at the end of the course. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

* **NELC 004b, Earliest Literature of the Ancient World** Benjamin Foster

Selections from ancient Near Eastern literature, such as myths and epics, stories, fables, letters, magic spells, and poetry, with emphasis on themes that resonate with a modern reader: memory, entertainment, success, love, heroism, violence, suffering, redemption, devotion, faith, sexuality, anxiety, humor, wonder, cynicism, and going to school. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

* **NELC 026b / ARCG 031b / CLCV 059b / EVST 030b / HIST 020b, Rivers and Civilization** Harvey Weiss

The appearance of the earliest cities along the Nile and Euphrates in the fourth millennium B.C. Settlements along the rivers, the origins of agriculture, the production and extraction of agricultural surpluses, and the generation of class structures and political hierarchies. How and why these processes occurred along the banks of these rivers; consequent societal collapses and their relation to abrupt climate changes. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU, SO

Foundations Courses

NELC 128a / HUMS 128a, From Gilgamesh to Persepolis: Introduction to Near Eastern Literatures Kathryn Slanski

This lecture course is an introduction to Near Eastern civilization through its rich and diverse literary cultures. We read and discuss ancient works, such as the *Epic of Gilgamesh*, *Genesis*, and “The Song of Songs,” medieval works, such as *A Thousand and One Nights*, selections from the *Qur’an*, and *Shah-nama: The Book of Kings*, and modern works of Israeli, Turkish, and Iranian novelists and Palestinian poets. Students complement classroom studies with visits to the Yale Babylonian Collection and the Beinecke Rare Book and Manuscript Library, as well as with film screenings and guest speakers. Students also learn fundamentals of Near Eastern writing systems, and consider questions of tradition, transmission, and translation. All readings are in translation. WR, HU

History and Civilization Courses

NELC 109a / ARCG 244a / RLST 245a, The Age of Akhenaton John Darnell

Study of the period of the Egyptian pharaoh Akhenaton (reigned 1353–1336 B.C.E.), often termed the Amarna Revolution, from historical, literary, religious, artistic, and archaeological perspectives. Consideration of the wider Egyptian, ancient Near Eastern, African, and Mediterranean contexts. Examination of the international diplomacy, solar theology, and artistic developments of the period. Reading of primary source material in translation. HU

NELC 115a, The Bible in Its Ancient Near Eastern Setting Eckart Frahm

History of the Assyrian, Babylonian, and Persian empires of the first millennium B.C.E.; how their rise and fall influenced the politics, religion, and literary traditions

of biblical Israel. Topics include the role of prophecy and (divine) law, political and religious justifications of violence, the birth of monotheism, and the historical reliability of the Hebrew Bible. HU

NELC 201a / ENGL 191a / LITR 318a, The Arabian Nights, Then and Now Shawkat Toorawa

Exploration of *Arabian Nights*, a classic of world literature. Topics include antecedents, themes and later prose, and graphic and film adaptations. HU

* **NELC 232a / JDST 256a / MMES 236a / RLST 400a, The Dead Sea Scrolls: The Damascus Document** Steven Fraade

Study of the Damascus Document, one of the most important of the Dead Sea Scrolls. Attention to the document's place in the history of biblical interpretation and ancient Jewish law; the nature and rhetorical function of its textual practices, both narrative and legal; and its relation to the central sectarian writings of the Qumran community. Prerequisite: reading proficiency in ancient Hebrew. L5, HU

* **NELC 241b / HUMS 212, Mystical Poetry of Judaism and Islam** Shawkat Toorawa
Poetry and song run through the heart of both Judaism and Islam, and so-called mystical verse plays a vital role within both traditions. This class looks at key works from both of these bodies of verse, on their own terms and in relation to one another. It also examines the cultural and historical matrices that gave rise to the poetry. Subjects range from alphabets of creation, the poetry of ascent, wine poetry, and the divine nature of the beloved to negative theology, interacting planes of macrocosm and microcosm, antinomian breakthrough, and, above all, poetry's power to bring about critical transformations of consciousness. Readings are drawn from the Bible, Hebrew visionary poetry of Late Antiquity (Poems of the Palaces, Book of Creation), pre- and early-Islamic material, the Qur'an, the Arabized Hebrew of two major Andalusian poets, Solomon Ibn Gabirol and Judah HaLevi, the syncretic Sufism of Ibn al-'Arabi and of the great Persian poets Rumi and Hafez, the extensive Kabbalistic tradition that developed in 13th-century Spain and 16th-century Palestine, the hybrid liturgy of the Muslim-Jewish Donmeh of Salonika (and their Turkish precursors), Ghalib's Urdu ghazals, Kabir's Bhakti-influenced vernacular Hindi poetry, and secular transformations of this mystical material into the modern era. All work is read in English translation. Material in the original languages is available to interested students. HU

NELC 268b / ARCG 226b / EVST 226b, Global Environmental History Harvey Weiss
The dynamic relationship between environmental and social forces from the Pleistocene glaciations to the Anthropocene present. Pleistocene extinctions; transition from hunting and gathering to agriculture; origins of cities, states, and civilization; adaptations and collapses of Old and New World civilizations in the face of climate disasters; the destruction and reconstruction of the New World by the Old. Focus on issues of adaptation, resilience, and sustainability, including forces that caused long-term societal change. SO

* **NELC 271b / ARCG 217, From Africa to Arabia: Worlds of the Ancient Red Sea**
Julien Cooper

This course introduces students to the diverse and unique worlds of the ancient Red Sea, from Ancient Egypt, the Kingdoms of South Arabia, ancient Ethiopia, and the myriad nomadic peoples who dwelt on its shores. The focus of the course is how the specific geography of the Red Sea shaped the history of trade and politics in the region,

juxtaposed with much better researched ancient maritime spaces in the Mediterranean. Students learn about many ancient cultures and empires not commonly encountered in history courses, as well as how this frequently ignored space acted as one of the most important trading corridors in the ancient world. HU

* **NELC 272b / ARCG 219, Ancient African Empires: Aksum & Kush** Julien Cooper
This course is an introduction to the long history of two of Africa's most ancient civilizations, that of Kush (Nubia) and Aksum (Ethiopia). The course traces the history of Sudan and Ethiopia from the foundations of Kushite culture (c. 2000 BCE) and the Kingdom of Da'emat (c. 800 BCE), chronicling the apogees of these civilizations until the eclipse of these cultures at the hands of the burgeoning Arab-Islamic caliphate and internal rivalries in the early Medieval Period. Lectures weave through the narratives of these Northeast African empires, introducing students to the multi-ethnic complexities of the Sudanese and Ethiopian worlds, their history, religions, and complex geographies. Students gain an appreciation for the history of Africa, a world seldom treated in university courses, being outside the parameters of 'classical civilizations' of the Mediterranean, the Near East, China, and India and also beyond the southern frontiers of Pharaonic Egypt. Particular focus is also taken on the reception and legacy of Kushite and Ethiopian civilization in modernity. A myriad of Archaeological, textual, epigraphic, numismatic, and other sources is used to visually convey the history of these African kingdoms. HU

* **NELC 381a / JDST 391a / RLST 407a, Midrash Seminar: Sifre Shofetim** Steven Fraade
Close study of the earliest rabbinic commentary to the Book of Deuteronomy, focusing on its interpretations of laws dealing with the responsibilities of courts and public figures: judges, kings, priests, and prophets. Particular attention is paid to the interrelation of rabbinic legal rhetoric and the hermeneutics of scriptural commentary, with comparisons to other corpora of ancient Jewish and non-Jewish laws. Prerequisite: reading fluency in ancient Hebrew. L5, HU

Languages and Literatures

AKKADIAN

Students wishing to study Akkadian should consult the director of undergraduate studies.

ARABIC

ARBC 110a, Elementary Modern Standard Arabic I Muhammad Aziz
Development of a basic knowledge of Modern Standard Arabic. Emphasis on grammatical analysis, vocabulary acquisition, and the growth of skills in speaking, listening, reading, and writing. L1 1½ Course cr

ARBC 120b, Elementary Modern Standard Arabic II Staff
Continuation of ARBC 110. Prerequisite: ARBC 110 or requisite score on a placement test. L2 RP 1½ Course cr

* **ARBC 130a, Intermediate Modern Standard Arabic I** Staff
Intensive review of grammar; readings from contemporary and classical Arab authors with emphasis on serial reading of unvoweled Arabic texts, prose composition, and

formal conversation. Prerequisite: ARBC 120 or requisite score on a placement test. L3
RP 1½ Course cr

ARBC 136a, Intermediate Classical Arabic I Shawkat Toorawa

Introduction to classical Arabic, with emphasis on grammar to improve analytical reading skills. Readings include Qur'anic passages, literary material in both poetry and prose, biographical entries, and religious texts. Prerequisite: ARBC 120 or permission of instructor. May be taken concurrently with ARBC 130 or 150. L3 RP

ARBC 140b, Intermediate Modern Standard Arabic II Staff

Continuation of ARBC 130. Prerequisite: ARBC 130 or requisite score on a placement test. L4 RP 1½ Course cr

ARBC 146b, Intermediate Classical Arabic II Shawkat Toorawa

Continuation of ARBC 136. Prerequisite: ARBC 136 or permission of instructor. May be taken concurrently with ARBC 140 or 151. L4 RP

*** ARBC 150a, Advanced Modern Standard Arabic I** Sarab Al Ani

Further development of listening, writing, and speaking skills. For students who already have a substantial background in Modern Standard Arabic. Prerequisite: ARBC 140 or requisite score on a placement test. L5 RP

*** ARBC 151b, Advanced Modern Standard Arabic II** Sarab Al Ani

Continuation of ARBC 150. Prerequisite: ARBC 150 or requisite score on a placement test. L5 RP

*** ARBC 162a / MMES 262a, Modern Arabic Political Thought** Sarab Al Ani

Works by influential Arab thinkers, leaders, and politicians who represent liberal nationalism, Arab nationalism, Islamism, and critiques of contemporary Arab society. Ways in which the authors use language both to portray their beliefs and to shape new social concepts in the Arab world. Prerequisite: ARBC 151 or equivalent, or with permission of the instructor. L5 RP

ARBC 164b, Literature and Justice: Arab Writers on Trial Jonas Elbousty

Texts by selected Arab writers who were put on trial as a result of their narratives. Why literary writers are put on trial, and how they, in turn, put culture and society on trial. The role of literature as a political actor in struggles over ethics and meaning. Prerequisite: ARBC 150. L5

ARBC 170a / ARBC 526a / NELC 236 / NELC 558a, Creative Writing in Arabic Jonas Elbousty

This course combines both analysis and production of literary texts. Students study modern Arabic literary texts as a vehicle for generating their own creative prose and to engage with prose, personal essay, and other literary genres attending particularly to how authors evoke experience through character, setting, dialog, etc. The class looks to popular fiction in Arabic and focuses upon the writer's craft to create vivid and engaging narratives. This analysis provides inspiration for students writing their own unique creative pieces and encourages them to polish their ability to express themselves in Arabic. Prerequisite: ARBC 140. L5 RP

*** ARBC 176b / MMES 178b, Languages in Dialogue: Arabic and Hebrew** Sarab Al Ani

Arabic and Hebrew are closely related as sister Semitic languages. They have a great degree of grammatical, morphological, and lexical similarity. Historically, Arabic and

Hebrew have been in cultural contact, especially in medieval Spain, the Middle East, and North Africa—as evidenced by the Judeo-Arabic languages. Arabic is the native tongue of about 20% of the population that resides in Israel, yet lack of communication exists today between Hebrew speakers and Arabic speakers. This L5 advanced Arabic class explores cultural and linguistic contacts between the two languages as well as parallel aspects between the communities. Additionally, students benefit from regular meetings with a corresponding L5 Hebrew class, which discusses similar topics. The shared meetings enable Arabic learners and Hebrew learners to participate together in one class, to bring to light the similarities between the two sister languages and to explore key social issues based on mutual respect while focusing on cultural and linguistic aspects of the material. L5 in Arabic, or equivalent (placement test). L5

ARBC 193a, Moroccan Arabic Jonas Elbousty

A basic course in the Moroccan dialect of Arabic. Principles of grammar and syntax; foundations for conversation and listening comprehension. Prerequisite: ARBC 130 or equivalent. RP

ARMENIAN

ARMN 450a, Classical Armenian I Staff

This is an introduction to Classical Armenian, an ancient literary language used from the fifth century onward. Students cover all the essential grammar in one term and begin reading texts. L1

ARMN 451b, Classical Armenian II Staff

Introduction to reading Classical Armenian texts from a variety of genres for students who have acquired the basics of Classical Armenian grammar. Prerequisite: NELC 450 or permission of instructor. L2

EGYPTIAN

EGYP 110a, Introduction to Classical Hieroglyphic Egyptian I Staff

Introduction to the language of ancient pharaonic Egypt (Middle Egyptian) and its hieroglyphic writing system, with short historical, literary, and religious texts. Grammatical analysis with exercises in reading, translation, and composition. L1

EGYP 117a, Elementary Biblical Coptic I Stephen Davis

The native Egyptian language in the Roman and Byzantine periods. Thorough grounding in grammar and vocabulary of the Sahidic dialect as a basis for reading biblical, monastic, and Gnostic texts. Credit only on completion of EGYP 127. L1 RP

EGYP 120b, Introduction to Classical Hieroglyphic Egyptian II Staff

Continuation of EGYP 110. Prerequisite: EGYP 110. L2 RP

EGYP 127b, Elementary Biblical Coptic II Stephen Davis

Continued study of the native Egyptian language in the Roman and Byzantine periods. Thorough grounding in grammar and vocabulary of the Sahidic dialect as a basis for reading biblical, monastic, and Gnostic texts. Prerequisite: EGYP 117. L2 RP

* **EGYP 128a / AFST 128a / ARCG 128a / RLST 251a, Magic and Ritual in Ancient Egypt** John Darnell

Introduction to ancient Egyptian magic and rituals with an overview on the use of magic and discussion of the different rituals and festivals attested in Ancient Egypt.

HU

*** EGYPT 131a, Intermediate Egyptian: Literary Texts** John Darnell

Close reading of Middle Egyptian literary texts; introduction to the hieratic (cursive) Egyptian script. Readings include the Middle Kingdom stories of Sinuhe and the Eloquent Peasant and excerpts from Wisdom Literature. Prerequisite: EGYPT 120. L3 RP

*** EGYPT 135b, Egyptian Coffin Texts** John Darnell

Readings of the religious texts of Middle Kingdom coffins. Focus on creation accounts, the Shu texts, spells of transformation, and the Book of the Two Ways. Readings in both normalized hieroglyphic transcription and original cursive hieroglyphic writing. Study of coffin panels in the collection of the Yale Art Gallery. Prerequisite: EGYPT 120. L3, HU RP

HEBREW

HEBR 110a, Elementary Modern Hebrew I Dina Roginsky

Introduction to the language of contemporary Israel, both spoken and written. Fundamentals of grammar; extensive practice in speaking, reading, and writing under the guidance of a native speaker. L1 1½ Course cr

HEBR 120b, Elementary Modern Hebrew II Orit Yeret

Continuation of HEBR 110. Introduction to the language of contemporary Israel, both spoken and written. Fundamentals of grammar; extensive practice in speaking, reading, and writing under the guidance of a native speaker. Prerequisite: HEBR 110 or equivalent. L2 RP 1½ Course cr

*** HEBR 130a, Intermediate Modern Hebrew I** Shiri Goren

Review and continuation of grammatical study, leading to a deeper understanding of style and usage. Focus on selected readings and on writing, comprehension, and speaking skills. Prerequisite: HEBR 120 or equivalent. L3 RP 1½ Course cr

*** HEBR 137a, Intermediate Biblical Hebrew I** Staff

Review and continuation of grammatical study leading to a deeper comprehension of biblical Hebrew style. Focus on extended reading of biblical narrative, poetry, prophecy, and Wisdom texts. Prerequisite: HEBR 127 or equivalent. L3 RP

HEBR 140b, Intermediate Modern Hebrew II Orit Yeret

Continuation of HEBR 130. Review and continuation of grammatical study leading to a deeper comprehension of style and usage. Focus on selected readings and on writing, comprehension, and speaking skills. Prerequisite: HEBR 130 or equivalent. L4 RP

*** HEBR 147b, Intermediate Biblical Hebrew II** Staff

Continuation of HEBR 137. Prerequisite: HEBR 137 or equivalent. L4 RP

*** HEBR 150a / JDST 213a / MMES 150a, Advanced Modern Hebrew: Daily Life in Israel** Orit Yeret

An examination of major controversies in Israeli society. Readings include newspaper editorials and academic articles as well as documentary and historical material. Advanced grammatical structures are introduced and practiced. Conducted in Hebrew. Prerequisite: HEBR 140 or equivalent. L5 RP

*** HEBR 158b / JDST 305b / MMES 168b, Contemporary Israeli Society in Film** Shiri Goren

Examination of major themes in Israeli society through film, with emphasis on language study. Topics include migration, gender and sexuality, Jewish/Israeli identity,

and private and collective memory. Readings in Hebrew and English provide a sociohistorical background and bases for class discussion. HEBR 140 or permission of instructor. L5, HU RP

* **HEBR 162a / JDST 319a / MMES 161a, Israel in Ideology and Practice** Dina Roginsky

An advanced Hebrew class focusing on changing ideology and politics in Israel. Topics include right and left wing political discourse, elections, State-Religion dynamics, the Jewish-Arab divide, and demographic changes. Materials include newspapers, publications, on-line resources, speeches of different political and religious groups, and contemporary and archival footage. Comparisons to American political and ideological discourse. Prerequisite: HEBR 140 or permission of instructor. L5 RP

* **HEBR 164b / JDST 417b / MMES 167b, Biblical to Modern Hebrew for Reading Knowledge** Dina Roginsky

Instruction in the linguistic needs of students who have reading knowledge of Biblical Hebrew but cannot read or converse in Modern Hebrew. Concentration on reading comprehension of Modern Hebrew for research purposes, particularly scholarly texts tailored to students' areas of interest. Two years of Biblical or Modern Hebrew studies, or permission of the instructor. RP

* **HEBR 167a / JDST 402a / MMES 166a, Creative Writing in Hebrew** Orit Yeret

An advanced language course with focus on creative writing and self-expression. Students develop knowledge of modern Hebrew, while elevating writing skills based on special interests, and in various genres, including short prose, poetry, dramatic writing, and journalism. Students engage with diverse authentic materials, with emphasis on Israeli literature, culture, and society. Prerequisite: HEBR 140 or placement exam. L5 RP

* **HEBR 169b / JDST 403b / MMES 162b, Languages in Dialogue: Hebrew and Arabic** Dina Roginsky

Hebrew and Arabic are closely related as sister Semitic languages. They have a great degree of grammatical, morphological, and lexical similarity. Historically, Hebrew and Arabic have been in cultural contact, especially in medieval Spain, the Middle East, and North Africa—as evidenced by the Judeo-Arabic languages. In modern Israel, Arabic is the native tongue of about 20% of its population, yet lack of communication exists today between Hebrew speakers and Arabic speakers for mainly political reasons. This L5 advanced Hebrew class explores cultural and linguistic contacts between the two languages and relationships between the communities, including both Jewish and non-Jewish Arabic speakers and Hebrew speakers. Additionally, students benefit from regular meetings with a parallel L5 Arabic class which discusses similar topics. The shared meetings enable Hebrew learners and Arabic learners to participate together in one class, to promote social interaction based on mutual respect and to focus on cultural and linguistic aspects of the material. L4 Hebrew or equivalent (placement test). L5 RP

OTTOMAN TURKISH

Students wishing to study Ottoman Turkish should consult the director of undergraduate studies.

PERSIAN

PERS 110a, Elementary Persian I Farkhondeh Shayesteh

Introduction to modern Persian, with emphasis on all four language skills: reading, writing, listening, and speaking. L1 1½ Course cr

PERS 120b, Elementary Persian II Farkhondeh Shayesteh

Continuation of PERS 110, with emphasis on all four language skills: reading, writing, listening, and speaking. Prerequisite: PERS 110 or permission of instructor. L2 RP 1½ Course cr

PERS 130a, Intermediate Persian I Farkhondeh Shayesteh

Continuation of PERS 120, with emphasis on expanding vocabulary and understanding more complex grammatical forms and syntax. Prerequisite: PERS 120 or permission of instructor. L3 RP 1½ Course cr

PERS 140b, Intermediate Persian II Farkhondeh Shayesteh

Continuation of PERS 130, with emphasis on expanding vocabulary and understanding more complex grammatical forms and syntax. Prerequisite: PERS 130 or permission of instructor. L4 RP 1½ Course cr

*** PERS 151a, Persian Culture and Media** Farkhondeh Shayesteh

Advanced study of Persian grammar, vocabulary, and culture through the use of authentic Persian media. Examination of daily media reports on cultural, political, historical, and sporting events in Iran, Afghanistan, Tajikistan, and other Persian-speaking regions. Designed for nonnative speakers. Prerequisite: PERS 140 or permission of instructor. L5

SYRIAC

Students wishing to study Syriac should consult the director of undergraduate studies.

TURKISH

TKSH 110a, Elementary Modern Turkish I Selim Tiryakiol

Integration of basic listening, reading, speaking, and writing skills through a variety of functional, meaningful, and contextual activities. Students become active users of modern Turkish and gain a deeper understanding of Anatolian culture through lessons based on real-life situations and authentic materials. L1 RP 1½ Course cr

TKSH 120b, Elementary Modern Turkish II Selim Tiryakiol

Continuation of TKSH 110. Prerequisite: TKSH 110 or permission of instructor. L2 RP 1½ Course cr

TKSH 130a, Intermediate Turkish I Selim Tiryakiol

Continued study of modern Turkish, with emphasis on advanced syntax, vocabulary acquisition, and the beginnings of free oral and written expression. Prerequisite: TKSH 120 or permission of instructor. L3 RP 1½ Course cr

TKSH 140b, Intermediate Turkish II Selim Tiryakiol

Continuation of TKSH 130. Prerequisite: TKSH 130. L4 RP 1½ Course cr

TKSH 150a, Advanced Turkish I Selim Tiryakiol

An advanced language course focused on improving students' reading, writing, listening, and speaking skills in modern Turkish. Extensive study of vocabulary and idiomatic expressions. Readings from genres including academic articles, critical

essays, literature, newspaper articles, and formal business writing. Screening of films, documentaries, and news broadcasts. Prerequisite: TKSH 140. L5 RP

Senior Essay

* **NELC 492a and NELC 493b, The Senior Essay** Jonas Elbousty

Preparation of a research paper of at least thirty pages (sixty pages for a two-term essay) under the supervision of a departmental faculty member, in accordance with the following schedule: (1) by the end of the second week of classes of the fall term, students meet with advisers to discuss the topic, approach, sources, and bibliography of the essay. Note: students planning to write the essay in the second term (NELC 493) should also meet with their prospective advisers by this deadline; (2) by the end of the fourth week of classes a prospectus with outline, including an annotated bibliography of materials in one or more Near Eastern languages and of secondary sources, is signed by the adviser and submitted to the director of undergraduate studies. The prospectus should indicate the formal title, scope, and focus of the essay, as well as the proposed research method, including detailed indications of the nature and extent of materials in a Near Eastern language that will be used; (3) at the end of the tenth week of classes (end of February for yearlong essays), a rough draft of the complete essay is submitted to the adviser; (4) two copies of the finished paper must be submitted to the director of undergraduate studies, Rm 314 HGS, by 4 p.m. on the last day of reading period. Failure to comply with the deadline will be penalized by a lower grade. Senior essays will be graded by departmental faculty unless, for exceptional reasons, different arrangements for an outside reader are made in advance with the director of undergraduate studies and the departmental adviser.

GRADUATE AND PROFESSIONAL SCHOOL COURSES OF INTEREST TO UNDERGRADUATES

Some Graduate School courses are open to qualified undergraduates with permission of the instructor and of the director of graduate studies. For course descriptions see the Online Course Information Website. (Also see “Courses in the Yale Graduate and Professional Schools” under “Special Arrangements” in the Academic Regulations.)

Neuroscience

Directors of undergraduate studies: Damon Clark (neuroscience.dus@yale.edu) (MCDB), KBT 224; Nicholas Turk-Browne (neuroscience.dus@yale.edu) (Psychology), SSS 305; neuroscience.yale.edu

Neuroscience aims to understand how the brain produces the mind and behavior, with the goal of advancing human understanding, improving physical and mental health, and optimizing performance. This entails a broad, interdisciplinary effort that spans from molecules to minds. At one end, biology, chemistry, and physics are improving our understanding of the molecular and cellular mechanisms of neuronal signaling and development. At the other end, psychology, psychiatry, and computer science link neural processes and systems to the mind and behavior. At all levels, the rich array of methods and data analysis depends on a strong foundation in the basic sciences, mathematics, statistics, and computer science.

PREREQUISITES

The foundational biology courses required of all Neuroscience majors are BIOL 101, 102, 103, and 104. All majors must also complete one of the following: PSYC 200, S&DS 103, 105, 238.

PLACEMENT PROCEDURES

Students must apply to enter the major. Applications are reviewed at the end of each term; decisions are based on a cover letter, transcript, and completed Neuroscience major worksheet. More information regarding the application process is available on the program website.

REQUIREMENTS OF THE MAJOR

Both the B.S. and B.A. degree programs require a minimum of 18.5 credits, including the three prerequisites, 15 lecture or seminar courses (which include the senior requirement), and one laboratory, as follows:

1. Two neuroscience foundation courses, NSCI 160 and 320.
2. One neuroscience lab chosen from NSCI 229L, 235, 258, 260, 321L.
3. Eleven electives from the following core groupings, with a minimum of: two from the Systems/Circuits/Behavior Core, two from the Molecular/Cellular/Biological Core, one from the Quantitative Core, one from the Computational Core (previously Advanced Allied Core), and one from the Basic Allied Core. No more than two credits may be taken from the Other Allied Core.

Systems/Circuits/Behavior Core: NSCI 340, 341, 346, 352, 355, 360, 442, 445

Molecular/Cellular/Biological Core: NSCI 324, 325, 420; MCDB 200, 202, 205, 210, 310, 370, 450, 452; MB&B 300 or MCDB 300

Quantitative Core: MATH 112, 115, 116, 120, 222, 225, 230, 231, 244, 246, 247; ENAS 151; NSCI 324, 325; CPSC 202

Computational Core (previously Advanced Allied Core): CPSC 100, 112, 201, 223, 323, 365, 470, 475, 476; S&DS 123, 362, 361

Basic Allied Core: PHYS 170, 171, 180, 181, 200, 201, 260, 261; CHEM 161, 163, 165, 167, 174, 175, 220, 221

Other Allied Core: NSCI 141, 147, 161, 240; BENG 485; MCDB 250; CGSC 110; PSYC 110; one additional lab course from the list above

Credit/D/Fail No course taken Credit/D/Fail may be counted toward the major, including prerequisites.

Roadmap See visual roadmap of the requirements.

SENIOR REQUIREMENT

In addition to the course requirements described above, all students must satisfy a senior requirement undertaken during the senior year. All students must fill out a checklist of requirements and go over it with the undergraduate registrar by the spring term of the junior year.

B.S. degree program The B.S. degree program requires two course credits of empirical research, NSCI 490 and 491. These courses are only available to Neuroscience seniors and receive a letter grade. Students are expected to spend at least ten hours per week in the laboratory, to complete written assignments, and to make a presentation. In addition to time in the lab, and as part of NSCI 490 and 491, students are expected to attend a regular capstone seminar, to hear guest speakers and to discuss senior work progress with their peers and the directors of undergraduate studies (DUSes). Research can be conducted over original, archival, or consortium data sets. Written assignments include a short research proposal summary due at the beginning of the term, and a full research report due at the end of the term. Students are encouraged to pursue the same research project for two terms, in which case, the first term full research report acts as the second term proposal, and the second term research report covers the work done in both terms of research. Final papers are due by the stated deadline near the end of the second term and the second term proposal summary may be combined into a full research proposal due at the end of the first term. Final papers are due by the stated deadline near the end of the term. Seniors are also required to present their research in the spring term. Students should find a research laboratory during the term preceding the research. Yale College does not grant academic credit for summer research unless the student is enrolled in an independent research course in Yale Summer Session. To register for NSCI 490 and 491, students must submit a form and a written plan of study with bibliography, approved by the faculty research adviser and DUS, by the end of the first week of classes.

B.A. degree program The B.A. degree program requires two course credits in non-empirical research, NSCI 480 and 481; or one credit in non-empirical research, NSCI 480 or 481, and one credit in empirical research, NSCI 490 or 491. These courses are only open to Neuroscience seniors and receive a letter grade. Under faculty supervision, for NSCI 480 or 481, students are required to conduct a literature review, complete written assignments, and make a presentation. The final research paper is due to the sponsoring faculty member, with a copy submitted to the department, by the stated deadline near the end of the term. Seniors are also required to present their research in the spring term. To register, students must submit a form and a written plan

of study with bibliography, approved by the faculty research adviser and DUS, by the end of the first week of classes.

More detailed guidelines, forms, and deadline information is available on the department website.

ADVISING

Departmental advisers Schedules for all majors must be discussed with, and approved by, one of the DUSes. Only then may a schedule be submitted to the residential college dean's office. For questions concerning credits for courses taken at other institutions, or courses not listed in this bulletin, students should consult with one of the DUSes.

REQUIREMENTS OF THE MAJOR

Prerequisites BIOL 101, 102, 103, and 104; and one of PSYC 200, S&DS 103, 105, 238

Number of courses 18.5 courses (incl prereqs and senior req)

Specific courses required 2 neuroscience foundation courses, NSCI 160 and 320

Distribution of courses *B.S. or B.A.* – 1 lab course; 11 electives incl at least: 2 Systems/Circuits/Behavior Core courses, 2 Molecular/Cellular/Biological Core courses, 1 Quantitative Core course, 1 Computational Core course, 1 Basic Allied Core course, and no more than 2 Other Allied Core courses

Senior requirement *B.S.* – 2 empirical research courses, NSCI 490 and 491; *B.A.* – 2 non-empirical research courses, NSCI 480 and 481, or 1 empirical research course (NSCI 490 or 491) and 1 non-empirical research course (NSCI 480 or 481)

FACULTY OF THE NEUROSCIENCE MAJOR

Professors †Amy Arnsten (*School of Medicine, Psychology*), Tom Brown (*Psychology*), Ty Cannon (*Psychology*), John Carlson (*Molecular, Cellular, and Developmental Biology*), B. J. Casey (*Psychology*), Marvin Chun (*Psychology*), Paul Forscher (*Molecular, Cellular, and Developmental Biology*), Jutta Joorman (*Psychology*), Douglas Kankel (*Molecular, Cellular, and Developmental Biology*), Haig Keshishian (*Molecular, Cellular, and Developmental Biology*), †John Krystal (*School of Medicine, Psychology*), †Daeyeol Lee (*School of Medicine, Psychology*), †Linda Mayes (*School of Medicine, Psychology*), Greg McCarthy (*Psychology*), Laurie Santos (*Psychology*), †Dana Small (*School of Medicine, Psychology*), †Jane Taylor (*School of Medicine, Psychology*), Nick Turk-Browne (*Psychology*), Robert Wyman (*Molecular, Cellular, and Developmental Biology*)

Associate Professors †Sreeganga Chandra (*School of Medicine, Molecular, Cellular, and Developmental Biology*), Damon Clark (*Molecular, Cellular, and Developmental Biology*), Thierry Emonet (*Molecular, Cellular, and Developmental Biology*), Weimin Zhong (*Molecular, Cellular, and Developmental Biology*)

Assistant Professors †Alan Anticevic (*School of Medicine, Psychology*), Arielle Baskin-Sommers (*Psychology*), Steve Chang (*Psychology*), †Philip Corlett (*School of Medicine, Psychology*), Molly Crockett (*Psychology*), Dylan Gee (*Psychology*), Avram Holmes (*Psychology*), †Hedy Kober (*School of Medicine, Psychology*), †Ifat Levy (*School of Medicine, Psychology*), †James McPartland (*School of Medicine, Psychology*)

Lecturer Nelson Donegan (*Psychology*)

†A joint appointment with primary affiliation in another department or school.

Courses

NSCI 160a / PSYC 160a, The Human Brain Gregory McCarthy

Introduction to the neural bases of human psychological function, including social, cognitive, and affective processing. Preparation for more advanced courses in cognitive and social neuroscience. Topics include memory, reward processing, neuroeconomics, individual differences, emotion, social inferences, and clinical disorders. Neuroanatomy, neurophysiology, and neuropharmacology are also introduced. SC

NSCI 161b / PSYC 161b, Drugs, Brain, and Behavior Hedy Kober

An introduction to psychoactive drugs and their effects on both brain and behavior. Review of pharmacological and brain mechanisms of different classes of legal, illegal, and medicinal drugs, including alcohol, caffeine, tobacco, stimulants, depressants, antidepressants, and hallucinogens. Individual drugs' pharmacokinetics, mechanisms of action, dosing, routes of administration, and patterns and effects of use and misuse. Some attention to substance use disorders/addictions, prevention, and treatment. SC

* **NSCI 229Lb / PSYC 229Lb, Laboratory in Human Neuroscience** Gregory McCarthy

Instruction in the acquisition and analysis of human neuroscience data. This laboratory complements the lecture course "Methods in Human Neuroscience" (PSYC 230/NSCI 240). The main topics include structural, diffusion, and functional magnetic resonance imaging (MRI), electroencephalography (EEG), and event-related potentials. Students engage in laboratory exercise that illustrate the design and analysis of experiments using each technique. These laboratory exercises involve acquiring, visualizing, and analyzing MRI and EEG data. Prerequisites: PSYC 160/NSCI 160, PSYC 200, PSYC 230/NSCI 240, or permission of the instructor. SC RP ½ Course cr

NSCI 320a / MCDB 320a, Neurobiology Haig Keshishian and Paul Forscher

The excitability of the nerve cell membrane as a starting point for the study of molecular, cellular, and systems-level mechanisms underlying the generation and control of behavior. Prerequisites: year of college-level chemistry; a course in physics is strongly recommended. SC

NSCI 321La / MCDB 321La, Laboratory for Neurobiology Haig Keshishian, Robert Wyman, and Paul Forscher

Introduction to the neurosciences. Projects include the study of neuronal excitability, sensory transduction, CNS function, synaptic physiology, and neuroanatomy. Concurrently with or after MCDB 320. SC ½ Course cr

NSCI 324a / MB&B 330a / MCDB 330a, Modeling Biological Systems I Thierry Emonet and Kathryn Miller-Jensen

Study of the analytic and computational skills needed to model genetic networks and protein signaling pathways. Review of basic biochemical concepts including chemical reactions, ligand binding to receptors, cooperativity, and Michaelis-Menten enzyme kinetics. Deep exploration of biological systems including: kinetics of RNA and protein synthesis and degradation; transcription activators and repressors; lysogeny/lysis switch of lambda phage and the roles of cooperativity and feedback; network motifs such as feed-forward networks and how they shape response dynamics; cell signaling, MAP kinase networks and cell fate decisions; bacterial chemotaxis; and noise in gene expression and phenotypic variability. Students learn to model using MatLab in a

series of in-class hackathons that illustrate biological examples discussed in lectures. Prerequisites: BIOL 101-104, or with permission of instructors. QR, SC

NSCI 325b / BENG 465b / MB&B 361b / MCDB 361b, Modeling Biological Systems II

Damon Clark, Thierry Emonet, and Jonathon Howard

Advanced topics related to dynamical processes in biological systems. Processes by which cells compute, count, tell time, oscillate, and generate spatial patterns. Time-dependent dynamics in regulatory, signal-transduction, and neuronal networks; fluctuations, growth, and form. Comparisons between models and experimental data. Dynamical models applied to neurons, neural systems, and cellular biophysical processes. Use of MATLAB to create models. Prerequisite: MCDB 330 or equivalent, or a 200-level biology course, or with permission of instructor. QR

NSCI 340b / PSYC 335b, Cognitive Neuroscience Steve Wohn Chang

This course covers how cognition is made by the brain. Students learn brain mechanisms underlying human cognition, including making decisions, paying attention, regulating emotion, remembering events, as well as understanding others. The course discusses both established and newly emerging findings based on several landmark experiments in both humans and animals. During this process, students are also introduced to cutting-edge techniques in cognitive neuroscience for studying human cognition. Prerequisite: PSYC 160 or specific chapter readings from the instructor. SC

NSCI 341a / PSYC 376a, Learning and Memory Thomas Brown

The basic facts, general principles, and theories that describe how higher animals, from mice to humans, are changed by their experiences. The historically separate fields of learning and memory research desegregated under a neuroscientific perspective that recognizes the evolutionary continuity among higher animals. Prerequisite: Introductory courses in biology and psychology, or permission of instructor. SC, SO

NSCI 346b / PSYC 321b, Psychopharmacology Thomas Brown

Study of therapeutic and recreational drugs that affect the central nervous system and influence mood, cognition, perception, and behavior. Drugs considered vary from psychotropic to hypnotic to narcotic. Prerequisite: PSYC 160 or 170 or equivalent, or permission of instructor. SC

NSCI 352a / CGSC 352a / PSYC 352a, Arrested or Adaptive Development of the Adolescent Brain BJ Casey

Study of empirical and theoretical accounts of adolescent-specific changes in the brain and in behavior that relate to the development of self control. Discussions will focus on adaptive and arrested adolescent brain development in the context of relevant legal, social, and health policy issues. SC

*** NSCI 419b / CGSC 419b / PSYC 419b, Topics in Brain Development, Law, and Policy** BJ Casey

Healthy development is a fundamental right of the individual, regardless of race, ethnicity, socioeconomic status, or gender. Youth require special protections of their rights due to vulnerabilities related to their physical and mental immaturity. These rights include, not only protections, but opportunities for building the cognitive, emotional, and social skills necessary for becoming a healthy adult and a contributing member of society. This seminar examines the extent to which legal policies and practices in the treatment of youths are consistent with scientific knowledge on

psychological and brain development. Each class discusses one or more legal cases highlighted in the context of brain and psychological science and current laws and policies. Prerequisite: PSYC 110 and PSYC 160 preferred. SO

* **NSCI 440b / CGSC 420b / PSYC 420b, Topics in Clinical Neuroscience** Avram Holmes

An overview and examination of the neuroscience of psychiatric illness. We focus on cutting-edge research in humans and animals aimed at understanding the biological mechanisms that underlie psychiatric illness. Although these questions date back to early philosophical texts, only recently have experimental psychologists and neuroscientists begun to explore this vast and exciting domain of study. We discuss the evolutionary and developmental origins of individual differences in human personality, measurement issues, fundamental dimensions of psychopathology, stability/plasticity, heritability, and implications therapeutic interventions as well as the associated broader implications for public policy. A major focus is on the neurobiology of fear and anxiety, including brain circuits, molecular genetic pathways, and epigenetics. A secondary focus is on differences in behavior and biology that confer risk for the development of depression and addiction, including the biological systems involved in hedonic pleasure, motivated goal pursuit, and the regulation of impulses in the face of everyday temptation. Students should have some background in psychology; PSYC 110 and PSYC 160 preferred. SO

[**NSCI 445, Systems Neuroscience**]

* **NSCI 470a or b and NSCI 471a or b, Independent Research** Damon Clark and Nicholas Turk-Browne

Research project under faculty supervision taken Pass/Fail; does not count toward the major, but does count toward graduation requirements. Students are expected to spend approximately ten hours per week in the laboratory. A final research report and/or presentation is required by end of term. Students who take this course more than once must reapply each term. To register, students must submit a form and written plan of study with bibliography, approved by the faculty research adviser and DUS, by the end of the first week of class. More detailed guidelines and forms can be obtained from <http://neuroscience.yale.edu>.

* **NSCI 480a and NSCI 481b, Senior Non-empirical Research** Damon Clark and Nicholas Turk-Browne

Research survey under faculty supervision fulfills the senior requirement for the B.A. degree and awards a letter grade. For NSCI seniors only (and second term juniors with DUS permission). Students are expected to conduct a literature review, to complete written assignments, and to present their research once in either the fall or spring term. Students are encouraged to pursue the same research project for two terms. The final research paper is due in the hands of the sponsoring faculty member, with a copy submitted to the department, by the stated deadline near the end of the term. To register, students submit a form and written plan of study with bibliography, approved by the faculty research adviser and DUS, by the end of the first week of classes. More detailed guidelines and forms can be obtained from <http://neuroscience.yale.edu>.

* **NSCI 490a and NSCI 491b, Senior Empirical Research** Damon Clark and Nicholas Turk-Browne

Laboratory or independent empirical research project under faculty supervision to fulfill the senior requirement for the B.S. degree. For NSCI seniors only (and second term juniors with DUS permission); this course awards a letter grade. Students are expected to spend at least ten hours per week in the laboratory, to complete written assignments, and to present their research once in either the fall or the spring term. Written assignments include a short research proposal summary due at the beginning of the term and a full research report due at the end of the term. Students are encouraged to pursue the same research project for two terms, in which case, the first term research report and the second term proposal summary may be combined into a full research proposal due at the end of the first term. Final papers are due by the stated deadline. Students should reserve a research laboratory during the term preceding the research. To register, students must submit a form and written plan of study with bibliography, approved by the faculty research adviser and DUS, by the end of the first week of classes. More detailed guidelines and forms can be obtained from <http://neuroscience.yale.edu>.

Philosophy

Director of undergraduate studies: Daniel Greco (daniel.greco@yale.edu), 106A C, 432-1687; (daniel.greco@yale.edu) philosophy.yale.edu

The Philosophy major prepares students to reflect critically and creatively on questions concerning the nature of things, the scope and limits of human understanding, and the principles of value and right action. The aim of the major is to address these questions wherever they arise, whether in the philosophical tradition, in other disciplines and practices, or in everyday life. Our courses are designed to encourage depth in thinking, rigor in argument, clarity in writing and speaking, and the widest possible view of whatever subject matter we take up.

COURSES FOR NONMAJORS AND MAJORS

Introductory philosophy courses, numbered 100 through 199, are open to all students and have no prerequisites.

COURSE NUMBERING

Courses numbered 100 through 199 are introductory and have no prerequisites. Courses numbered 200 through 399 are intermediate. Some have prerequisites; others do not, and may be taken as a student's first course in philosophy, though such a student should consult the instructor first. In general, it is a good idea to take a broadly based course in any area of philosophy before taking a specialized course. Courses numbered 400 through 499 are seminars. These advanced courses are intended primarily for juniors and seniors, though other students may be admitted with the instructor's permission. Undergraduates should be sure they have enough background to take such a course, including previous work in the same area of philosophy. Students with questions should consult the instructor.

PREREQUISITES

Standard major Prerequisite to the standard major are two introductory or intermediate philosophy courses.

Psychology track Prerequisite to the major in the psychology track are two courses in philosophy or psychology.

REQUIREMENTS OF THE MAJOR

The standard major The major requires twelve courses (including the prerequisites and the senior requirement) that collectively expose students to a wide range of philosophy and philosophers. The Philosophy curriculum is divided into three broad groups: history of philosophy; metaphysics and epistemology; and ethics and value theory. In history of philosophy, majors are required to take (a) either PHIL 125 and 126 or both terms of Directed Studies (DRST 003, 004), and (b) an additional, third course in history of philosophy. Majors are encouraged to take PHIL 125 and 126 as early as possible; these courses may be taken in either order. Majors must also complete two courses in metaphysics and epistemology, two courses in ethics and value theory, and a course in logic (such as PHIL 115), the last preferably by the fall of their junior year. Majors must also take two seminars (either or both of which can be counted toward one of the group requirements) and satisfy the senior requirement as described below.

All courses in Philosophy count toward the twelve-course requirement. With approval from the director of undergraduate studies (DUS), courses offered by other departments may be counted toward the major requirements, though no more than two such courses will normally be allowed.

Specific regulations for the group requirements are as follows:

1. Some introductory courses do not count toward any group requirement. Other courses count toward a group requirement unless they are otherwise designated.
2. Courses automatically count toward the group under which they are listed in this bulletin. In rare cases, a course will be designated as counting toward a second group, although no single course can be counted by the same student toward two group requirements. In addition, students may petition to have a course count toward a group other than the one under which it is listed in this bulletin, though the presumption will be against such petitions.
3. Courses taken in other departments and applied to the major will not normally count toward a group requirement. Students may petition for credit toward a group requirement, though the presumption will be against such petitions.

The psychology track The psychology track is designed for students interested in both philosophy and psychology. Majors in the track must take seven courses in philosophy and five in psychology, for a total of twelve, including the prerequisites and senior requirement. The seven philosophy courses must include (a) two courses in the history of philosophy, usually PHIL 125 and 126 or DRST 003 and 004, (b) a course in logic, such as PHIL 115, preferably by the fall of the junior year, (c) two seminars, one of which may be in the Psychology department, with the approval of the DUS, and (d) at least two courses at the intermediate or advanced level that bear on the intersection of philosophy and psychology, at least one of which must be a philosophy seminar. Courses satisfying (d) must be approved by the DUS. The five psychology courses must include PSYC 110 or its equivalent. Each major must also satisfy the senior requirement as described below.

Credit/D/Fail No more than one course taken Credit/D/Fail may be counted toward the major, with the permission of the DUS. This applies to both the standard and the psychology tracks.

SENIOR REQUIREMENT

The senior requirement is normally satisfied by completing a third philosophy seminar. Students taking a seminar to satisfy the senior requirement are expected to produce work superior in argument and articulation to that of a standard seminar paper. To this end, students taking a seminar for the senior requirement must satisfy additional requirements, which may include (a) additional readings, (b) submission of a complete draft of the final paper by the eighth week of the term that will then be significantly revised, and (c) one-on-one or small-group meetings with the instructor to discuss class material, the additional readings, and drafts in preparation. The specific nature of these additional requirements will vary from seminar to seminar, so students planning to satisfy the requirement with a third seminar should express that intention to the instructor at the beginning of the term, so the instructor can explain the work that will be required.

In special cases, students may meet the senior requirement through either a one-term or a two-term independent project supervised by an instructor (PHIL 490, 491). Students must petition to fulfill the senior requirement through an independent project, and approval is not guaranteed. Applicants must submit a proposal to the DUS, in consultation with an appropriate supervisor, by the end of the term prior to beginning the independent study.

ADVISING

Each major should, by October 1 of the junior year, secure the agreement of a member of the Philosophy department to serve as adviser for the year. The adviser aids the student in choosing courses and in planning for the senior year. All senior majors must have their schedules signed by the DUS.

Other majors involving philosophy Majors in Mathematics and Philosophy and in Physics and Philosophy are also available. Students interested in philosophy and psychology should also consider the major in Cognitive Science.

REQUIREMENTS OF THE MAJOR

Prerequisites *Standard track*—any 2 intro or intermediate phil courses; *Psychology track*—any 2 courses in phil or psych

Number of courses *Both tracks*—12 term courses, incl prereqs and senior req

Specific courses required *Standard track*—PHIL 125 and 126, or DRST 003 and 004; *Psychology track*—PSYC 110 or equivalent

Distribution of courses *Standard track*—3 courses in hist of phil (incl PHIL 125 and 126, or DRST 003 and 004), 2 in metaphysics and epistemology, 2 in ethics and value theory, and 1 in logic; 2 phil sems; *Psychology track*—7 courses in phil, as specified; 5 courses in psych

Substitution permitted *Standard track*—2 related courses in other depts, with DUS permission

Senior requirement *Both tracks*—a third sem in phil, or a one- or two-term independent project (PHIL 490, 491)

FACULTY OF THE DEPARTMENT OF PHILOSOPHY

Professors Seyla Benhabib, David Charles, Stephen Darwall, Michael Della Rocca, Keith DeRose, Paul Franks, Tamar Gendler, John Hare, Verity Harte, Brad Inwood, Shelly Kagan, Joshua Knobe, Thomas Pogge, Scott Shapiro, Sun-Joo Shin, Steven Smith, Jason Stanley, Zoltán Szabó, Kenneth Winkler, Gideon Yaffe

Assistant Professors Robin Dembroff, Daniel Greco, John Pittard

Introductory Courses

* **PHIL 091a, Philosophy of Games** Mark Maxwell

In this class, we critically discuss a variety of puzzles that arise when thinking about games. Just what are games, anyway? And, how can thinking in terms of games help us understand the world? The notion of 'game' is a topic of interest in its own right, but games can also serve as a model and metaphor for other parts of the world, including life as a whole and the exploration of other philosophical debates. As such, the study of games serves as an entry point to a number of topics of potential interest, rather

than just an in-depth study of one topic. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

PHIL 115a, First-Order Logic Kenneth Winkler

An introduction to formal logic. Study of the formal deductive systems and semantics for both propositional and predicate logic. Some discussion of metatheory. QR

* **PHIL 192a / RLST 107a, Metaphysics and Modernity** Nancy Levene

This course surveys concepts and controversies in and among select works of philosophy, theology, and literature. The focus is twofold: on reading works in view of their own principles, thus on questions of truth and interpretation, and on histories of the ideas, thus on questions of origin, change, and story. What and when is metaphysics? What and when is modernity? HU

HISTORY OF PHILOSOPHY

PHIL 125a / CLCV 125a, Introduction to Ancient Philosophy Verity Harte

An introduction to ancient philosophy, beginning with the earliest pre-Socratics, concentrating on Plato and Aristotle, and including a brief foray into Hellenistic philosophy. Intended to be taken in conjunction with PHIL 126. WR, HU

PHIL 126b, Introduction to Modern Philosophy from Descartes to Kant Kenneth Winkler

An introduction to major figures in the history of modern philosophy, with critical reading of works by Descartes, Malabranche, Spinoza, Leibniz, Locke, Berkeley, Hume, and Kant. Intended to be taken in conjunction with PHIL 125, although PHIL 125 is not a prerequisite. HU

* **PHIL 135b / RLST 166b, Classical Arabic Philosophy** Frank Griffel

Close reading of primary texts from the Arabic philosophical tradition c. 750–1300, with attention to the major arguments and underlying assumptions of each author. The translation movement via al-Farabi, Ibn Sina (Avicenna), al-Ghazali, Maimonides, and others; the philosophical textbooks of Muslim madrasa education. HU

ETHICS AND VALUE THEORY

PHIL 130a / EDST 135a, Philosophy of Education Jason Stanley

An introduction to the philosophy of education. In this course, we read classical texts about the nature and purpose of education, focusing ultimately on the question of the normative shape and form of education in liberal democracy. What is the difference between education and indoctrination? What is the proper relation, in a liberal democracy, between civic education and vocational education? What shape or form should education take, if it is to achieve its goals? How, for example, is the liberal ideal of equality best realized in the form and structure of an educational system? Authors include Plato, Rousseau, Du Bois, Washington, Stanton, Dewey, Cooper, Woodson, and Freire. HU

PHIL 175b, Introduction to Ethics Shelly Kagan

What makes one act right and another wrong? What am I morally required to do for others? What is the basis of morality? These are some of the questions raised in moral philosophy. Examination of two of the most important answers, the theories of Mill and Kant, with brief consideration of the views of Hume and Hobbes. Discussion of the question: Why be moral? HU

PHIL 177b / AFAM 198b / CGSC 277b / EDST 177b / EP&E 494b, Propaganda, Ideology, and Democracy Jason Stanley

Historical, philosophical, psychological, and linguistic introduction to the issues and challenges that propaganda raises for liberal democracy. How propaganda can work to undermine democracy; ways in which schools and the press are implicated; the use of propaganda by social movements to address democracy's deficiencies; the legitimacy of propaganda in cases of political crisis. HU

PHIL 180b / PLSC 191b, Ethics and International Affairs Thomas Pogge

Moral reflection taken beyond state boundaries. Traditional questions about state conduct and international relations as well as more recent questions about intergovernmental agencies, nongovernmental organizations, and the design of global institutional arrangements. HU

Intermediate Courses

HISTORY OF PHILOSOPHY

* **PHIL 202a / RLST 277a, Existentialism** Noreen Khawaja

Introduction to key problems in European existentialism. Existentialism considered not as a unified movement, but as a tradition of interlocking ideas about human freedom woven through the philosophy, religious thought, art, and political theory of late modern Europe. Readings from Kierkegaard, Nietzsche, Heidegger, Fanon, Sartre, de Beauvoir, Césaire. HU

PHIL 203a / EALL 212a, Ancient Chinese Thought Michael Hunter

An introduction to the foundational works of ancient Chinese thought from the ruling ideologies of the earliest historical dynasties, through the Warring States masters, to the Qin and Han empires. Topics include Confucianism and Daoism, the role of the intellectual in ancient Chinese society, and the nature and performance of wisdom. HU

PHIL 204a / GMAN 381a, Kant's Critique of Pure Reason Paul Franks

An examination of the metaphysical and epistemological doctrines of Kant's *Critique of Pure Reason*. Prerequisite: PHIL 126 or DRST 004. HU

METAPHYSICS AND EPISTEMOLOGY

PHIL 267b, Mathematical Logic Sun-Joo Shin

An introduction to the metatheory of first-order logic, up to and including the completeness theorem for the first-order calculus. Introduction to the basic concepts of set theory. Prerequisite: PHIL 115 or permission of instructor. QR

PHIL 269b, The Philosophy of Science Mark Maxwell

Central questions about the nature of scientific theory and practice. Factors that make a discipline a science; how and why scientific theories change over time; interpreting probabilistic claims in science; whether simpler theories are more likely to be true; the laws of nature; whether physics has a special status compared to other sciences; the legitimacy of adaptationist thinking in evolutionary biology. HU

PHIL 270b, Epistemology Keith DeRose

Introduction to current topics in the theory of knowledge. The analysis of knowledge, justified belief, rationality, certainty, and evidence. HU

PHIL 271b / LING 271b, Philosophy of Language Jason Stanley

An introduction to contemporary philosophy of language, organized around four broad topics: meaning, reference, context, and communication. Introduction to the use of logical notation. HU

PHIL 281a, Infinity Zoltán Szabó

The idea of infinity. Traditional and contemporary versions of the paradoxes of space, time, and motion, as well as the paradoxes of classes, chances, and truth. Some elementary arithmetic, geometry, probability theory, and set theory. QR, HU

*** PHIL 305b / CGSC 313b / PSYC 313b, Philosophy for Psychologists** Joshua Knobe

Introduction to frameworks developed within philosophy that have applications in psychological research. Principal topics include the self, causation, free will, and morality. Recommended preparation: a course in philosophy or psychology. HU, SO

*** PHIL 311b / RLST 303b, The End of Metaphysics** Nancy Levene

Exploration of metaphysics in light of the supposition that it is at an end. Readings from classics and critics in philosophy, religion, and literature. WR, HU

ETHICS AND VALUE THEORY

*** PHIL 338b, Happiness and Misery** David Charles

The goal of the course is to investigate and assess the accounts of happiness and misery offered by historical philosophers such as Plato, Aristotle, Augustine, Kant, and Mill and by more recent thinkers such as Bernard Williams, Philippa Foot, Christine Korsgaard, and Thomas Nagel. We also consider some recent psychological work on related topics. Enrollment priority is given to junior and seniors. HU

Seminars

*** PHIL 493b / ANTH 428b / RLST 428b, Neighbors and Others** Nancy Levene

This course is an interdisciplinary investigation of concepts and stories of family, community, borders, ethics, love, and antagonism. Otherwise put, it concerns the struggles of life with others – the logic, art, ethnography, and psychology of those struggles. The starting point is a complex of ideas at the center of religions, which are given to differentiating "us" from "them" while also identifying values such as the love of the neighbor that are to override all differences. But religion is only one avenue into the motif of the neighbor, a fraught term of both proximity and distance, a contested term and practice trailing in its wake lovers, enemies, kin, gods, and strangers. Who is my neighbor? What is this to ask, and what does the question ask of us? Course material includes philosophy, anthropology, psychology, fiction, poetry, and film. HU

HISTORY OF PHILOSOPHY

*** PHIL 402a / GMAN 227a / HUMS 330a / LITR 330a, Heidegger's Being and Time**
Martin Hägglund

Systematic, chapter by chapter study of Heidegger's *Being and Time*, arguably the most important work of philosophy in the twentieth-century. All major themes addressed in detail, with particular emphasis on care, time, death, and the meaning of being. HU

PHIL 410b / EALL 308b / HUMS 305b, Sages of the Ancient World Michael Hunter

Comparative survey of ancient discourses about wisdom from China, India, the Near East, Egypt, Greece, and Rome. Topics include teaching, scheming, and dying. HU

* **PHIL 413a, History of Analytic Philosophy** Paul Franks

The problems and methods of early analytic philosophers, including Frege, Russell, Moore, Wittgenstein, and the logical positivists. Problems such as realism, *a priori* propositions and convention, logic and meaning, empirical knowledge, and verification and truth. Methods of analysis that deploy formal notations; studies of ordinary and scientific uses of language. HU

* **PHIL 494a, Topics in Kant** Thomas Pogge

Featuring some of the most important and difficult texts in philosophy, this seminar involves a close reading of Kant's works from one subset of his philosophy. It also guides students to identify and engage with the most insightful secondary literature and to grapple with Kant's arguments both orally and in writing. Each instantiation of the seminar selects readings according to student and instructor interests, with a focus for instance on Kant's epistemology, centering around his *Critique of Pure Reason*, on his moral philosophy, as developed in his *Groundwork* and *Critique of Practical Reason*, or on his political philosophy and teachings about human progress. Students may take this seminar twice in consecutive years, provided a different set of Kant's works is covered. Prerequisites: Two courses in the history of philosophy, or one such course with the instructor's permission. WR, HU

* **PHIL 496b, Plato's Gorgias** Verity Harte

Plato's *Gorgias* contains the most sustained and dramatic encounter between Socratic philosophical conversation and rhetoric. This encounter sets the stage for some of Plato's richest philosophical reflections on moral psychology and on the philosophy of philosophy. The course focuses on careful reading of the *Gorgias* with a view to engaging these philosophical topics. All readings are in translation, though a Greek reading group may be added for interested and suitably qualified students. Taught seminar-style, engaged, active student participation is expected. Class discussion typically starts from student questions circulated in advance. Prerequisites: A course in ancient philosophy (such as PHIL 125 or Directed Studies Fall Philosophy) and at least one additional course in Philosophy. HU

* **PHIL 498b, Acrasia: Ancient and Modern** David Charles

The goal of this seminar is to investigate the accounts of weakness of the will (in Greek: *acrasia*, literally lack of control) offered by historical philosophers such as Plato, Aristotle, and Augustine and by more recent thinkers such as Donald Davidson, David Pears, Michael Bratman, and Richard Holton. This discussion raises problems about the nature of intentional action, the will and rationality. We also consider some recent psychological work on self-control and addiction. Priority is given to juniors and seniors. HU

METAPHYSICS AND EPISTEMOLOGY

* **PHIL 426a / CGSC 426a / EP&E 490a / PSYC 422a, The Cognitive Science of Morality** Joshua Knobe

Introduction to the emerging field of moral cognition. Focus on questions about the philosophical significance of psychological findings. Topics include the role of emotion in moral judgment; the significance of character traits in virtue ethics and personality psychology; the reliability of intuitions and the psychological processes that underlie them. HU

* **PHIL 427b, Computability and Logic** Sun-Joo Shin

A technical exposition of Gödel's first and second incompleteness theorems and of some of their consequences in proof theory and model theory, such as Löb's theorem, Tarski's undefinability of truth, provability logic, and nonstandard models of arithmetic.

Prerequisite: PHIL 267 or permission of instructor. QR, HU

* **PHIL 442a, Language and Power** Jason Stanley

Investigation into the way language shapes our social world, drawing on readings from feminist theory, critical race theory, formal semantics and pragmatics, political psychology, and European history. Prerequisite: one philosophy course; a basic course in logic would be helpful. HU

* **PHIL 495a, Philosophy of Mind and Artificial Intelligence** Daniel Greco

In this course, we draw on readings from philosophy, computer science, and some science fiction, to explore foundational issues in the philosophy of mind and artificial intelligence. Topics include the following: Could a suitably programmed computer be intelligent? In particular, is passing the Turing test sufficient to establish that a computer is intelligent? Does it make sense to talk of uploading one's consciousness to a computer as a method for increasing one's life span? Can consciousness be explained in physical terms? Prerequisites: Two PHIL courses. HU

ETHICS AND VALUE THEORY

* **PHIL 450b / EP&E 478b, The Problem of Evil** Keith DeRose

The challenge that evil's existence in the world poses for belief in a perfectly good and omnipotent God. The main formulations of the problem of evil; proposed ways of solving or mitigating the problem and criticism of those solutions. Skeptical theism, the free-will defense, soul-making theodicies, and doctrines of hell. HU

* **PHIL 452a, History of Early Modern Ethics** Stephen Darwall

An examination of seventeenth- and eighteenth-century ethical philosophy, including Hobbes, Hutcheson, Hume, Butler, Rousseau, Kant, Smith, and Bentham. HU

* **PHIL 455b / EP&E 334b, Normative Ethics** Shelly Kagan

A systematic examination of normative ethics, the part of moral philosophy that attempts to articulate and defend the basic principles of morality. The course surveys and explores some of the main normative factors relevant in determining the moral status of a given act or policy (features that help make a given act right or wrong). Brief consideration of some of the main views about the foundations of normative ethics (the ultimate basis or ground for the various moral principles). Prerequisite: a course in moral philosophy. HU

* **PHIL 457a / EP&E 235a / PLSC 283a, Recent Work on Justice** Thomas Pogge

In-depth study of one contemporary book, author, or debate in political philosophy, political theory, or normative economics. Focus varies from year to year based on student interest and may include a ground-breaking new book, the life's work of a prominent author, or an important theme in contemporary political thought. HU

* **PHIL 464b / PLSC 291b, Justice, Taxes, and Global Financial Integrity** Thomas Pogge

Study of the formulation, interpretation, and enforcement of national and international tax rules from the perspective of national and global economic justice. Previous courses

in one or two of the following: law, economics, political science, or political philosophy.

HU

Tutorial and Senior Essay Courses

* **PHIL 480a or b, Tutorial** Daniel Greco

A reading course supervised by a member of the department and satisfying the following conditions: (1) the work of the course must not be possible in an already existing course; (2) the course must involve a substantial amount of writing, i.e., a term essay or a series of short essays; (3) the student must meet with the instructor regularly, normally for at least an hour a week; (4) the proposed course of study must be approved by both the director of undergraduate studies and the instructor.

* **PHIL 490a and PHIL 491b, The Senior Essay** Daniel Greco

The essay, written under the supervision of a member of the department, should be a substantial paper; a suggested length is between 8,000 and 12,000 words for one-term projects, and between 12,500 and 15,000 words for two-term projects. Students completing a one-term project should enroll in either 490 in the fall or 491 in the spring. Students completing a two-term project should enroll in both 490 and 491. The deadline for senior essays completed in the fall is December 5; the deadline for both one- and two-term senior essays completed in the spring is April 21.

GRADUATE, DIVINITY, AND LAW SCHOOL COURSES THAT COUNT TOWARD THE MAJOR

Some Graduate, Divinity, and Law School courses are open to qualified undergraduates with permission of the instructor and the director of graduate studies or the dean or registrar of the Divinity or the Law School. (See "Courses in the Yale Graduate and Professional Schools" in section K of the Academic Regulations.) With permission of the director of undergraduate studies, relevant Graduate, Divinity, and Law School courses may count toward the major. Course descriptions appear in the Graduate, Divinity, and Law School bulletins.

Physics

Director of undergraduate studies: Simon Mochrie (dus.physics@yale.edu), 68C SPL, 436-4809 [F]; Reina Maruyama (dus.physics@yale.edu), Wright Lab 209, 432-3362 [Sp]; physics.yale.edu/academics/undergraduate-studies

The overarching goal of the physics program is to train students—majors and nonmajors alike—to think like physicists, the hallmarks of which include: striving for fundamental explanations that have broad predictive power; appreciating that quantitative analysis is necessary for proper understanding; simplifying physical situations to their essentials to enable the development of mathematical models to explain and predict experimental data; and comparing experimental data from the natural world to theory.

To achieve this goal, we offer courses for physics majors who intend to further their study of physics or any STEM field in graduate school, as well as those physics majors who intend to go into law, consulting, financial services, technology industries, teaching, or any number of fields. Many students enroll in our introductory courses as a compulsory requirement of their STEM major; to satisfy a requirement for admission into medical school; or because they appreciate the quantitative training and intrinsic value offered by a basic understanding of modern physics. The director of undergraduate studies (DUS) can help students prepare for graduate school in physics by recommending appropriate electives to supplement the core courses. Research experience (PHYS 469, 470, 471, and 472) is an important aspect of preparing for graduate school.

The department offers two majors in Physics: the B.S. and the B.S. intensive major. Students in either program acquire advanced training in physics, mathematics, and related topics through the core courses. They use electives to design individualized programs with more depth or breadth, depending on their interests. Both degree programs require some research experience. PHYS 469 and PHYS 470, introductory research courses, are open to all students. Juniors and seniors, as part of the senior requirement, are required to enroll in PHYS 471 and 472—one term for the B.S. degree and two terms for the B.S. degree, intensive major. Combined majors are available in Mathematics and Physics, Astrophysics, Physics and Philosophy, and Physics and Geosciences.

COURSES FOR NONMAJORS AND MAJORS

A guide to selecting physics courses is available to aid in course selection. Questions about placement should be addressed to the DUS.

Introductory courses with no calculus requirement Physics courses numbered 120 or below are for students with little or no previous experience in physics who do not plan to major in the natural sciences. Many of these courses fulfill the science and/or quantitative reasoning distributional requirements. These courses have no college-level mathematics requirement and do not satisfy the medical school requirement.

Introductory calculus-based lecture sequences

1. PHYS 170, 171 is aimed at students who are interested in the biological sciences or medicine. Knowledge of differential and integral calculus at the level of MATH 112

- or equivalent is a prerequisite. MATH 115 should be taken concurrently with PHYS 171. PHYS 170 is a prerequisite for PHYS 171.
- PHYS 180, 181 is aimed at students who plan to major in the physical sciences or engineering. Calculus at the level of MATH 112 is a prerequisite; MATH 115 and 120 should be taken concurrently. PHYS 180 or PHYS 200 is a prerequisite for PHYS 181.
 - PHYS 260, 261 is intended for students who have had excellent prior training in mathematics and a solid foundation in physics. One of MATH 120, ENAS 151, PHYS 301, or the two-course sequence MATH 230, 231, or the equivalent should be taken concurrently with PHYS 260, 261.

Introductory laboratories Two different introductory laboratory sequences are offered: PHYS 165L, 166L, and PHYS 205L, 206L. Each of these laboratory courses earns one-half course credit. Students normally take the laboratory courses associated with the introductory physics sequence in which they are enrolled.

- PHYS 165L, 166L is an introductory laboratory sequence aimed at students interested in engineering, the life sciences, and medicine. Related lecture courses are PHYS 170, 171, and PHYS 180, 181.
- PHYS 205L, 206L is for students who plan to major in the physical sciences or engineering. Related lecture courses are PHYS 180, 181; PHYS 200, 201; and PHYS 260, 261. Students who take the lecture courses in their first year are advised to start this laboratory sequence with PHYS 205L in the spring of their first year or in the fall of sophomore year.

Advanced electives A series of 340-level electives explores special topics of interest to both majors and nonmajors. The electives are open to any student in Yale College who has completed a year of introductory calculus-based physics (PHYS 170, 171; or 180, 181; or 200, 201; or 260, 261). The offerings for 2019–2020 include PHYS 341, PHYS 343, and PHYS 344.

PREREQUISITES

B.S. degree program The prerequisites include an introductory lecture course sequence with a mathematics sequence equivalent to, or more advanced than, the corequisite of the physics sequence. The following options are appropriate: PHYS 170, 171 with MATH 112, 115; or PHYS 180, 181 with MATH 115, 120; or PHYS 200, 201 with MATH 120 and either 222 or 225; or PHYS 260, 261 with MATH 120, ENAS 151, PHYS 301, or MATH 230, 231 or equivalent. In addition, the laboratory sequence PHYS 205L, 206L or PHYS 165L, 166L is required. Students who take these physics and mathematics courses starting in their first year may satisfy the prerequisites by the middle of their sophomore year. Students who begin taking physics courses in their sophomore year may also complete either the standard or the intensive major. Students are advised to take mathematics courses throughout their first year at the appropriate level.

B.S. degree program, intensive major The prerequisites for the B.S. degree with an intensive major are the same as for the standard program.

REQUIREMENTS OF THE MAJOR

B.S. degree program Eight courses are required beyond the prerequisites, including the senior project. Students must take a mathematics course at the level of, or more advanced than, PHYS 301. Three courses at the core of the major, PHYS 401, 402, and PHYS 439 or 440, involve advanced study of fundamental topics common to all branches of physics. PHYS 401 and 402 pertain to advanced classical physics (mechanics, statistical physics and thermodynamics, and electromagnetism), while the third, PHYS 439 or 440 covers quantum mechanics. PHYS 401 must be taken before PHYS 402, 439, or 440.

Three advanced elective courses are also required. Suitable advanced courses include the PHYS 340-level electives, an advanced laboratory such as PHYS 382L, and 400-level courses in Physics. Students may also find suitable advanced courses in other departments in the sciences, engineering, and mathematics. Courses taken to satisfy these requirements must be approved by the DUS. In order to pursue their individual interests in sufficient depth, many students choose to take more than the required number of advanced courses.

B.S. degree program, intensive major Ten courses are required beyond the prerequisites, including the senior project. Students must take a mathematics course at the level of, or more advanced than, PHYS 301. Five courses at the core of the major involve advanced study of fundamental topics common to all branches of physics. Three of the courses pertain to advanced classical physics: mechanics (PHYS 410), statistical physics and thermodynamics (PHYS 420), and electromagnetism (PHYS 430). Two other courses incorporate quantum mechanics (PHYS 440 and 441). Because the ideas build progressively: PHYS 410 must precede PHYS 440, and PHYS 440 must precede 441, 420, and 430.

Because experiment is at the heart of the discipline, the intensive major requires one term of advanced laboratory (PHYS 382L or equivalent) and at least two terms of independent research (PHYS 471, 472 or equivalent). One advanced elective course is required to complete the program. Suitable advanced courses include the PHYS 340-level electives and 400-level courses in Physics. Students may also find suitable advanced courses in other departments in the sciences, engineering, and mathematics. Courses taken to satisfy these requirements must be approved by the DUS. In order to pursue their individual interests in sufficient depth, many students choose to take more than ten advanced courses.

Credit/D/Fail courses Courses taken Credit/D/Fail may not be counted toward the requirements of either major.

Roadmap See visual roadmap of the requirements.

SENIOR REQUIREMENT

B.S. degree program The senior requirement for the standard B.S. degree is fulfilled by receiving a passing grade on a one-term research project in PHYS 471 or 472 or equivalent. Students should consult the DUS for further information.

B.S. degree program, intensive major The senior requirement for the intensive major is fulfilled by receiving a passing grade on a two-term research project in PHYS 471, 472 or equivalent. Students should consult the DUS for further information.

ADVISING

All Physics majors in the sophomore, junior, and senior classes must have their programs approved by the DUS. First-year students and undeclared sophomores who are interested in Physics or related majors are encouraged to meet with the DUS to discuss their questions and proposed programs.

For both the standard B.S. degree and the B.S. degree with an intensive major, students are advised to begin the program in their first year to allow the greatest amount of flexibility in course selection. It is possible, however, to complete either program in a total of six terms, as illustrated below.

A program for a student completing the Physics B.S. in three years might be:

First-Year or Sophomore	Sophomore or Junior	Senior
PHYS 170, 171, or 180, 181, or 200, 201, or 260, 261	PHYS 206L	PHYS 439 or PHYS 440
PHYS 205L	PHYS 301	PHYS 471 or 472
Mathematics corequisites	PHYS 401	Two advanced electives
	PHYS 402	
	One advanced elective	

A program for a student completing the intensive major in three years might be:

First-Year or Sophomore	Sophomore or Junior	Senior
PHYS 170, 171, or 180, 181, or 200, 201, or 260, 261	PHYS 206L	PHYS 441
PHYS 205L	PHYS 301	PHYS 420
Mathematics corequisites	PHYS 410	PHYS 430
	PHYS 440	PHYS 471
	PHYS 382L	PHYS 472
		One advanced elective

REQUIREMENTS OF THE MAJOR**B.S. DEGREE**

Prerequisites PHYS 170, 171 or 180, 181 or 200, 201 or 260, 261, with appropriate math coreqs; PHYS 205L, 206L or PHYS 165L, 166L

Number of courses 8 term courses beyond prereqs (incl senior req)

Specific courses required PHYS 301 or other advanced math course; PHYS 401, 402, and either PHYS 439 or 440, in sequence

Distribution of courses 3 advanced electives approved by DUS

Senior requirement PHYS 471 or 472 or equivalent

B.S. DEGREE, INTENSIVE MAJOR

Prerequisites PHYS 170, 171 or 180, 181 or 200, 201 or 260, 261, with appropriate math coreqs; PHYS 205L, 206L or PHYS 165L, 166L

Number of courses 10 term courses beyond prereqs (incl senior req)

Specific courses required PHYS 301 or other advanced math course; PHYS 410, 440, 441, 420, 430, in sequence; PHYS 382L or equivalent

Distribution of courses 1 advanced elective approved by DUS

Senior requirement PHYS 471 and 472 or equivalent

FACULTY OF THE DEPARTMENT OF PHYSICS

Professors †Charles Ahn, Yoram Alhassid, Thomas Appelquist, †Charles Bailyn, O. Keith Baker, Charles Baltay, Sean Barrett, †Hui Cao, Richard Casten (*Emeritus*), †Paolo Coppi, David DeMille, †Michel Devoret, †Debra Fischer, Bonnie Fleming, †Marla Geha, Steven Girvin, Larry Gladney, Leonid Glazman, John Harris, Karsten Heeger, †Victor Henrich, †Jonathon Howard, Francesco Iachello (*Emeritus*), †Sohrab Ismail-Beigi, Steven Lamoreaux, Simon Mochrie, Vincent Moncrief, †Priyamvada Natarajan, Peter Parker (*Emeritus*), †Daniel Prober, Nicholas Read, Jack Sandweiss (*Emeritus*), †Peter Schiffer, †Robert Schoelkopf, Ramamurti Shankar, Witold Skiba, †A. Douglas Stone, †Hong Tang, Paul Tipton (*Chair*), C. Megan Urry, †Pieter van Dokkum, †John Wettlaufer, Michael Zeller (*Emeritus*)

Associate Professors †Murat Acar, Helen Caines, Sarah Demers, †Thierry Emonet, Walter Goldberger, Jack Harris, Reina Maruyama, Daisuke Nagai, †Corey O'Hern, Nikhil Padmanabhan, David Poland

Assistant Professors †Eric Michael Brown, Meng Cheng, †Damon Clark, †Liang Jiang, Benjamin Machta, David Moore, †John Murray, †Michael Murrell, Nir Navon, Laura Newburgh, †Peter Rakich

Senior Lecturer Sidney Cahn

Lecturers Stephen Irons, Rona Ramos, Adriane Steinacker

†A joint appointment with primary affiliation in another department.

Courses

* **PHYS 040a / ASTR 040a, Expanding Ideas of Time and Space** C. Megan Urry
Discussions on the nature of time and space. Topics include the shape and contents of the universe, special and general relativity, dark and light matter, and dark energy. Observations and ideas fundamental to astronomers' current model of an expanding and accelerating four-dimensional universe. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SC

* **PHYS 050a / APHY 050a, Science of Modern Technology and Public Policy** Daniel Prober
Examination of the science behind selected advances in modern technology and implications for public policy, with focus on the scientific and contextual basis of each advance. Topics are developed by the participants with the instructor and with guest lecturers, and may include nanotechnology, quantum computation and cryptography, renewable energy technologies, optical systems for communication and medical diagnostics, transistors, satellite imaging and global positioning systems, large-scale immunization, and DNA made to order. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SC RP

*** PHYS 100b / APHY 100b / ENAS 100b / EVST 100b / G&G 105b, Energy Technology and Society** Daniel Prober

The technology and use of energy. Impacts on the environment, climate, security, and economy. Application of scientific reasoning and quantitative analysis. Intended for non-science majors with strong backgrounds in math and science. QR, SC

*** PHYS 107b / EDST 107b / MB&B 107b, Being Human in STEM** Rona Ramos

A collaboratively-designed, project-oriented course that seeks to examine, understand, and disseminate how diversity of gender, race, religion, sexuality, economic circumstances, etc. shape the STEM experience at Yale and nationally, and that seeks to formulate and implement solutions to issues that are identified. Study of relevant peer-reviewed literature and popular-press articles. Implementation of a questionnaire and interviews of STEM participants at Yale. Creation of role-play scenarios for provoking discussions and raising awareness. Design and implementation of group interventions. SO

PHYS 118b / MUSI 200b, The Physics of Music Sarah Demers

Basic concepts in physics introduced through study of the interplay between physics and music. The mathematics of harmony; tone production by musical instruments; sound propagation through spaces such as concert halls. QR, SC

*** PHYS 120b, Quantum Physics and Beyond** Helen Caines

Current topics in modern physics, beginning with quantum physics and continuing through subatomic physics, special and general relativity, cosmology, astrophysics, and string theory. SC

PHYS 151b / APHY 151b / ENAS 151b, Multivariable Calculus for Engineers Beth Anne Bennett

An introduction to multivariable calculus focusing on applications to engineering problems. Topics include vector-valued functions, vector analysis, partial differentiation, multiple integrals, vector calculus, and the theorems of Green, Stokes, and Gauss. Prerequisite: MATH 115 or equivalent. QR RP

PHYS 165La and PHYS 166Lb, General Physics Laboratory Helen Caines, Sean Barrett, Bonnie Fleming, and Steve Lamoreaux

A variety of individually self-contained experiments are roughly coordinated with the lectures in PHYS 170, 171, and 180, 181 and illustrate and develop physical principles covered in those lectures. SC ½ Course cr per term

*** PHYS 170a and PHYS 171b, University Physics for the Life Sciences** Simon Mochrie

An introduction to classical physics with special emphasis on applications drawn from the life sciences and medicine. Fall-term topics include vectors and kinematics, Newton's laws, momentum, energy, random walks, diffusion, fluid mechanics, mathematical modeling, and statistical mechanics. Spring-term topics include oscillations, waves, sound, electrostatics, circuits, Maxwell's equations, electromagnetic waves, gene circuits, and quantum mechanics. Essential mathematics are introduced and explained as needed. Completion of MATH 112 or equivalent is prerequisite for PHYS 170. Completion of PHYS 170 is a prerequisite for PHYS 171. MATH 116 (or MATH 115) is recommended prior to or concurrently with PHYS 171. QR, SC

PHYS 180a and PHYS 181b, University Physics Adriane Steinacker

A broad introduction to classical and modern physics for students who have some previous preparation in physics and mathematics. Fall-term topics include Newtonian mechanics, gravitation, waves, and thermodynamics. Spring-term topics include electromagnetism, special relativity, and quantum physics. Concurrently with MATH 115 and 120 or equivalents. See comparison of introductory sequences and laboratories in the YCPS. May not be taken for credit after PHYS 170, 171. QR, SC

PHYS 200a and PHYS 201b, Fundamentals of Physics Jack Harris

A thorough introduction to the principles and methods of physics for students who have good preparation in physics and mathematics. Emphasis on problem solving and quantitative reasoning. Fall-term topics include Newtonian mechanics, special relativity, gravitation, thermodynamics, and waves. Spring-term topics include electromagnetism, geometrical and physical optics, and elements of quantum mechanics. Prerequisite: MATH 115 or equivalent. MATH 210 and either MATH 225 or MATH 222, are generally taken concurrently. See comparison of introductory sequences and laboratories in the YCPS. QR, SC

PHYS 205La or b and PHYS 206La or b, Modern Physical Measurement Reina Maruyama and Staff

A two-term sequence of experiments in classical and modern physics for students who plan to major in Physics. In the first term, the basic principles of mechanics, electricity, and magnetism are illustrated in experiments designed to make use of computer data handling and teach error analysis. In the second term, students plan and carry out experiments illustrating aspects of wave and quantum phenomena and of atomic, solid state, and nuclear physics using modern instrumentation. May be begun in either term. SC ½ Course cr per term

*** PHYS 260a and PHYS 261b, Intensive Introductory Physics** Steven Girvin

An introduction to major branches of physics – classical and relativistic mechanics; gravitation; electricity and magnetism; and quantum physics, information, and computation – at a sophisticated level. For students majoring in the physical sciences, mathematics, and philosophy whose high school training included both mechanics and electricity and magnetism at the typical college/AP level and have excellent training in, and a flair for, mathematical methods and quantitative analysis. Concurrently with MATH 120, ENAS 151, PHYS 151, MATH 230 and 231, or PHYS 301, or equivalent. QR, SC

PHYS 293a / APHY 293a, Einstein and the Birth of Modern Physics A. Douglas Stone

The first twenty-five years of the 20th century represent a turning point in human civilization as for the first time mankind achieved a systematic and predictive understanding of the atomic level constituents of matter and energy, and the mathematical laws which describe the interaction of these constituents. In addition, the General Theory of Relativity opened up for the first time a quantitative study of cosmology, of the history of the universe as a whole. Albert Einstein was at the center of these breakthroughs, and also became an iconic figure beyond physics, representing scientist genius engaged in pure research into the fundamental laws of nature. This course addresses the nature of the transition to modern physics, underpinned by quantum and relativity theory, through study of Einstein's science, biography, and historical context. It also presents the basic concepts in electromagnetic theory,

thermodynamics and statistical mechanics, special theory of relativity, and quantum mechanics which were central to this revolutionary epoch in science. Prerequisites: Two terms of PHYS 170, 171, or PHYS 180, 181, or PHYS 200, 201, or PHYS 260, 261, or one term of any of these course with permission of instructor. QR, SC

PHYS 295a / ASTR 255a, Research Methods in Astrophysics Marla Geha

The acquisition and analysis of astrophysical data, including the design and use of ground- and space-based telescopes, computational manipulation of digitized images and spectra, and confrontation of data with theoretical models. Examples taken from current research at Yale and elsewhere. Use of the Python programming language. A background in high school calculus and physics. No previous programming experience required. QR, SC RP

PHYS 301a, Introduction to Mathematical Methods of Physics Oliver Baker

Topics include multivariable calculus, linear algebra, complex variables, vector calculus, and differential equations. Designed to give accelerated access to 400-level courses by providing, in one term, the essential background in mathematical methods. Recommended to be taken concurrently with PHYS 401 or 410. Prerequisite: PHYS 170, 171, or 180, 181, or 200, 201, or 260, 261, or permission of instructor. QR

PHYS 341b, Biological Physics Benjamin Machta

An introduction to the physics of biological structures and life processes, and to the burgeoning field of biological physics. Related concepts from probability theory and statistical physics are developed as needed. Prerequisite: PHYS 170, 171, or 180, 181, or 200, 201, or 260, 261, or permission of instructor. QR, SC

PHYS 342a / G&G 342a, Introduction to Earth and Environmental Physics John Wettlaufer

A broad introduction to the processes that affect the past, present, and future features of the Earth. Examples include climate and climate change and anthropogenic activities underlying them, planetary history, and their relation to our understanding of Earth's present dynamics and thermodynamics. Prerequisite: PHYS 170, 171, or 180, 181, or 200, 201, or 260, 261, or permission of instructor. Recommended preparation: familiarity with basic calculus and differential equations. QR, SC

PHYS 343b / ASTR 343b, Gravity, Astrophysics, and Cosmology Daisuke Nagai

Introduction to frontier areas of research in astrophysics and cosmology exploring ideas and methods. In-depth discussion of the physics underlying several recent discoveries including extrasolar planets—their discovery, properties, and issues of habitability; black holes—prediction of their properties from GR, observational signatures, and detection; and the accelerating universe—introduction to cosmological models and the discovery of dark energy. Prerequisites: PHYS 170, 171, or 180, 181, or 200, 201, or 260, 261, or permission of instructor. QR, SC

PHYS 353a / BENG 353a, Introduction to Biomechanics Michael Murrell

An introduction to the biomechanics used in biosolid mechanics, biofluid mechanics, biothermomechanics, and biochemomechanics. Diverse aspects of biomedical engineering, from basic mechanobiology to the design of novel biomaterials, medical devices, and surgical interventions. Prerequisites: PHYS 180, 181, MATH 115, and ENAS 194. QR

*** PHYS 356b / ASTR 356b / ASTR 556b, Astrostatistics and Data Mining** Hector Arce

Introduction to the statistical tools used to analyze and interpret astrophysical data, including common data mining techniques for finding patterns in large data sets and data-based prediction methods. Use of publicly available high-quality astronomical data from large surveys such as SDSS and 2MASS, and from space-based observatories such as Spitzer, Herschel, and WISE. Coding with the Python programming language. Prerequisite: ASTR 255 or equivalent. QR, SC

*** PHYS 382Lb, Advanced Physics Laboratory** Steve Lamoreaux and Nir Navon
Laboratory experiments with some discussion of theory and techniques. An advanced course focusing on modern experimental methods and concepts in atomic, optical, nuclear, and condensed matter physics. Intended to prepare students for independent research. For majors in the physical sciences. After or concurrently with PHYS 439 or 440, or with permission of instructor. PHYS 206L WR, SC

PHYS 401a and PHYS 402b, Advanced Classical Physics from Newton to Einstein
Nikhil Padmanabhan

Advanced physics as the field developed from the time of Newton to the age of Einstein. Topics include mechanics, electricity and magnetism, statistical physics, and thermodynamics. The development of classical physics into a "mature" scientific discipline, an idea that was subsequently shaken to the core by the revolutionary discoveries of quantum physics and relativity. Prerequisite: PHYS 170, 171, or 180, 181, or 200, 201, or 260, 261. Concurrently with PHYS 301 or other advanced mathematics course. QR, SC

PHYS 410a, Classical Mechanics Charles Baltay

An advanced treatment of mechanics, with a focus on the methods of Lagrange and Hamilton. Lectures and problems address the mechanics of particles, systems of particles, and rigid bodies, as well as free and forced oscillations. Introduction to chaos and special relativity. Prerequisite: PHYS 170, 171, or 180, 181, or 200, 201, or 260, 261. Concurrently with PHYS 301 or other advanced mathematics course. QR, SC

*** PHYS 420a / APHY 420a, Thermodynamics and Statistical Mechanics** Nir Navon

This course is subdivided into two topics. We study thermodynamics from a purely macroscopic point of view and then we devote time to the study of statistical mechanics, the microscopic foundation of thermodynamics. Prerequisites: PHYS 301, 410, and 440 or permission of instructor. QR, SC

PHYS 428a / AMTH 428a / E&EB 428a / G&G 428a, Science of Complex Systems Jun Korenaga

Introduction to the quantitative analysis of systems with many degrees of freedom. Fundamental components in the science of complex systems, including how to simulate complex systems, how to analyze model behaviors, and how to validate models using observations. Topics include cellular automata, bifurcation theory, deterministic chaos, self-organized criticality, renormalization, and inverse theory. Prerequisite: PHYS 301, MATH 247, or equivalent. QR, SC

PHYS 430b, Electromagnetic Fields and Optics David Moore

Electrostatics, magnetic fields of steady currents, electromagnetic waves, and relativistic dynamics. Provides a working knowledge of electrodynamics. Prerequisites: PHYS 301 and 410 or equivalents. QR, SC

PHYS 439a / APHY 439a, Basic Quantum Mechanics Robert Schoelkopf

The basic concepts and techniques of quantum mechanics essential for solid-state physics and quantum electronics. Topics include the Schrödinger treatment of the harmonic oscillator, atoms and molecules and tunneling, matrix methods, and perturbation theory. Prerequisites: PHYS 181 or 201, PHYS 301, or equivalents, or permission of instructor. QR, SC

PHYS 440b, Quantum Mechanics and Natural Phenomena I Ramamurti Shankar

The first term of a two-term sequence covering principles of quantum mechanics with examples of applications to atomic physics. The solution of bound-state eigenvalue problems, free scattering states, barrier penetration, the hydrogen-atom problem, perturbation theory, transition amplitudes, scattering, and approximation techniques. Prerequisite: PHYS 410 or 401. QR, SC

PHYS 441a, Quantum Mechanics and Natural Phenomena II Ramamurti Shankar

Continuation of PHYS 440. Prerequisite: PHYS 440. QR, SC

PHYS 442b, Introduction to Nuclear and Elementary Particle Physics Charles Baltay

Fundamental concepts in nuclear and particle physics, including the discovery of radioactivity, the Dirac equation, antimatter, Feynman diagrams, hadron resonances, quarks and gluons, fundamental symmetries, the weak interaction, beta decay, quantum chromodynamics, neutrino oscillation, unification, and particle theories for dark matter. Prerequisite: two term courses in quantum mechanics. QR, SC

PHYS 448a / APHY 448a, Solid State Physics I Sohrab Ismail-Beigi

The first term of a two-term sequence covering the principles underlying the electrical, thermal, magnetic, and optical properties of solids, including crystal structure, phonons, energy bands, semiconductors, Fermi surfaces, magnetic resonances, phase transitions, dielectrics, magnetic materials, and superconductors. Prerequisites: APHY 322, 439, PHYS 420. QR, SC

PHYS 449b / APHY 449b, Solid State Physics II Michel Devoret

The second term of the sequence described under APHY 448. QR, SC

PHYS 458a / APHY 458a, Principles of Optics with Applications Hui Cao

Introduction to the principles of optics and electromagnetic wave phenomena with applications to microscopy, optical fibers, laser spectroscopy, and nanostructure physics. Topics include propagation of light, reflection and refraction, guiding light, polarization, interference, diffraction, scattering, Fourier optics, and optical coherence. Prerequisite: PHYS 430. QR, SC

PHYS 460a, Mathematical Methods of Physics Nicholas Read

Survey of mathematical techniques useful in physics. Physical examples illustrate vector and tensor analysis, group theory, complex analysis (residue calculus, method of steepest descent), differential equations and Green's functions, and selected advanced topics. Prerequisite: PHYS 301 or other advanced mathematics course. QR

*** PHYS 469a and PHYS 470b / PHYS 470b, Independent Research in Physics** Staff

Each student works on an independent project under the supervision of a member of the faculty or research staff. Students participate in a series of seminar meetings in which they present a talk on their project or research related to it. A written report is also required. For students with a strong background in physics coursework. This

course may be taken multiple times for pass/fail credit. Suggested for first years and sophomores.

* **PHYS 471a and PHYS 472b, Independent Projects in Physics** Staff

Each student works on an independent project under the supervision of a member of the faculty or research staff. Students participate in a series of seminar meetings in which they present a talk on their project or research related to it. A written report is also required. Registration is limited to junior and senior physics majors. This course may be taken up to four times for a letter grade.

Physics and Geosciences

Directors of undergraduate studies: Simon Mochrie (dus.physics@yale.edu) (Physics), 68C SPL, 436-4809; Mary-Louise Timmermans (mary-louise.timmermans@yale.edu) (Geology and Geophysics), 111 KGL, 432-3167

The major in Physics and Geosciences applies fundamental physical principles to the study of Earth and other planetary bodies at a level that is more intensive than in the Physics or Geology and Geophysics majors individually. Topics of interest range from atmosphere, ocean, and climate dynamics to physics of the solid Earth or of other planetary bodies.

PREREQUISITES

The prerequisites for the major include MATH 120 or its equivalent, PHYS 170, 171 or another introductory physics sequence, the associated physics laboratory sequence PHYS 205L, 206L, and a course in ordinary differential equations chosen from ENAS 194, MATH 246, or PHYS 301.

REQUIREMENTS OF THE MAJOR

Beyond the prerequisites, the major requires a minimum of twelve term courses, including the senior project. At least four of these courses must be in Physics and at least six must be in Geology and Geophysics. Students complete a two- or three-term advanced physics sequence: either PHYS 401 and 402, or PHYS 410, 420, and 430. They must also take basic quantum mechanics (PHYS 439) and one elective numbered PHYS 320 or above. Required courses in Geology and Geophysics include one introductory course numbered G&G 100–150, with any accompanying laboratory; one elective numbered G&G 200 or above; and four advanced electives from one of two Geology and Geophysics tracks: the Atmosphere, Ocean, and Climate track or the Solid Earth Science track. A list of suggested electives is available from the office of the director of undergraduate studies (DUS) in Geology and Geophysics or on the G&G department website. No elective course may count toward multiple requirements for the major.

Credit/D/Fail No course taken Credit/D/Fail may be counted toward the Physics and Geosciences major, including prerequisites.

SENIOR REQUIREMENT

Students complete a two-term senior project on a topic that is appropriate for the combined major and acceptable to both the Physics and Geology and Geophysics departments. The project is undertaken in either PHYS 471, 472 or G&G 490, 491. In addition, students must present an oral report on their project to each department.

ADVISING

Interested students should consult the directors of undergraduate studies in Physics and in Geology and Geophysics.

REQUIREMENTS OF THE MAJOR

Prerequisites MATH 120 or equivalent; PHYS 170, 171 or above; PHYS 205L, 206L; ENAS 194, MATH 246, or PHYS 301

Number of courses At least 12 courses beyond prereqs, incl senior req

Specific courses required PHYS 401 and 402, or PHYS 410, 420, and 430; PHYS 439

Distribution of courses 1 elective numbered PHYS 320 or above; 1 intro course in G&G, with lab, as specified; 1 elective course numbered G&G 200 or above; 4 advanced courses in a G&G track, as specified

Senior requirement Senior project in PHYS 471, 472 or G&G 490, 491, on topic acceptable to both depts; oral report on project to both depts or equivalent

Physics and Philosophy

Directors of undergraduate studies: Simon Mochrie (dus.physics@yale.edu) (Physics), 68C SPL, 436-4809; Daniel Greco (daniel.greco@yale.edu) (Philosophy), 106A C, 432-1687

PREREQUISITES

Prospective majors in Physics and Philosophy are advised to begin taking the prerequisites during their first year, and to take at least two of the required Philosophy courses by the end of their sophomore year. Prerequisites for this major are as follows: mathematics through calculus at the level of MATH 120; any introductory Physics lecture sequence numbered 170 or higher; PHYS 165L and 166L, or 205L and 206L; and one introductory Philosophy course.

REQUIREMENTS OF THE MAJOR

Beyond the prerequisites, students take fourteen term courses, including the senior requirement. Seven courses in Physics approved by the director of undergraduate studies (DUS) and numbered 301 or higher are required, including PHYS 301 or equivalent and either PHYS 439 or 440. Six courses in Philosophy or in History of Science, Medicine, and Public Health are required, including PHIL 125 and 126, one course in logic above the introductory level, and a Philosophy seminar selected with the approval of the directors of undergraduate studies.

SENIOR REQUIREMENT

Seniors must complete one of the following: (1) PHYS 471 or 472 (independent project); (2) PHIL 490 or 491 (senior essay); (3) PHIL 480 (tutorial) on an appropriate subject; (4) an appropriate Philosophy seminar with the approval of the director of undergraduate studies in Philosophy.

REQUIREMENTS OF THE MAJOR

Prerequisites MATH 120; PHYS 170, 171, or 180, 181, or 200, 201, or 260, 261; PHYS 165L, 166L, or 205L, 206L; 1 intro Phil course

Number of courses 14 term courses beyond prereqs, incl senior req

Specific courses required PHYS 301 or equivalent; PHYS 439 or 440; PHIL 125, 126

Distribution of courses 7 Physics courses numbered 301 or higher approved by DUS; 6 courses in Phil or HSHM, incl 1 in logic above intro level and a Phil sem, as specified

Senior requirement 1 from PHYS 471 or 472, PHIL 490 or 491, PHIL 480 on appropriate topic, or approved Phil sem

Political Science

Director of undergraduate studies: David Simon (david.simon@yale.edu), 115 Prospect St., 432-5236; politicalscience.yale/edu

Political science addresses how individuals and groups allocate, organize, and challenge the power to make collective decisions involving public issues. The goal of the major is to enable students to think critically and analytically about the agents, incentives, and institutions that shape political phenomena within human society. The subfields of political philosophy and analytical political theory (which includes the study of both qualitative and quantitative methodology) support the acquisition of the lenses through which such thought skills can be enriched. The subfields of American government, comparative politics, and international relations, in turn, allow students to reinforce and refine those skills, while also promoting their application to a wide variety of contexts, whether contemporary or historical. Students may also construct interdisciplinary curriculums, which allows them to apply the approaches of the discipline to a topic for which a more complete understanding also involves approaches gleaned from other disciplines.

REQUIREMENTS OF THE MAJOR

The standard B.A. degree program Twelve term courses in political science are required. Students must take at least two courses in each of any three of the department's five fields – international relations, American government, political philosophy, analytical political theory, and comparative politics. Students expecting to major in Political Science are encouraged to take one or more introductory-level courses in the department early in their college careers. Introductory courses count toward the overall course requirement and toward the departmental fields requirement.

Students may also take courses related to political science that are offered by other departments. Students who elect the standard program may petition to count up to two such courses toward the major. Students may routinely count college seminars taught by members of the Political Science faculty toward the major, and they may petition to count one college seminar taught by an instructor outside the department. Students who have completed Directed Studies may, with the approval of the director of undergraduate studies (DUS), count one term of DRST 005, 006 toward the major.

The standard B.A. degree program, interdisciplinary concentration Students majoring in Political Science may choose an interdisciplinary concentration, which allows them to identify and pursue an area of study that crosses conventional disciplinary and departmental boundaries. Examples of interdisciplinary concentrations include (but are not limited to) urban studies, health politics and policy, political economy, political psychology, or a focus on the politics of given global region informed by the study of the history and society of that region. Students choosing an interdisciplinary concentration are required to take twelve term courses toward the major. At least seven courses must be in the field of concentration. Of the courses counting toward the major outside of the field of concentration, at least two courses must be taken in each of any two of the department's five fields. As many as three courses taken in other departments may be counted toward the major, with the permission of the DUS.

Students wishing to pursue the Political Science major with an interdisciplinary concentration must submit an application and meet with the DUS to discuss their proposed program of study. The application is due prior to the beginning of the November recess in the student's final year of enrollment.

The intensive major The intensive major gives students an opportunity to undertake more extensive course work and research for the senior essay than is possible in the standard major. Requirements for the intensive major are identical to those for the nonintensive major (standard program or interdisciplinary concentration), with the following exceptions: (1) in the spring term of the junior year, intensive majors take PLSC 474 in preparation for writing a yearlong senior essay; (2) in the senior year, intensive majors fulfill the senior essay requirement by enrolling in the yearlong course sequence PLSC 490 and PLSC 493 (PLSC 490 also counts toward the senior seminar requirement); (3) a total of fifteen term courses is required.

Juniors wishing to pursue an intensive major must apply to the DUS by November 22, 2019. The application should contain: (1) the intensive major application form signed by a faculty adviser who has agreed to supervise the student for the final three terms of enrollment; (2) a plan of study that identifies the political science courses that will be taken in those three terms; and (3) a one-to-two-page description of the proposed senior essay.

Seminar preregistration Each term, the department provides all declared Political Science majors the opportunity to apply for preregistration to its seminars. Instructors of seminars may preregister up to twelve students per course, or up to eight students for multiple-titled courses. The maximum enrollment for each seminar is eighteen. Students may be preregistered in up to two seminars per term, although they may enroll in others if they obtain instructor permission during shopping week.

Seminar requirement Students majoring in Political Science are required to take at least two seminars taught by members of the Political Science department, including at least one during the senior year.

Credit/D/Fail Students may count up to two lecture courses taken Credit/D/Fail toward the major, which will count as non-A grades for purposes of calculating distinction. Seminars taken Credit/D/F will not count toward the major requirements, but will count as non-A grades for purposes of calculating distinction.

Roadmap See visual roadmap of the requirements.

SENIOR REQUIREMENT

Seniors in the major must complete a senior essay. The essay can be written either in one term or over both terms of the senior year. In order to graduate from Yale College, a student majoring in Political Science must achieve a passing grade on the senior essay. The senior requirement for the standard B.A. degree program with an interdisciplinary concentration is the same as for the standard program, with the provision that the essay must be written on a subject that falls within the field of concentration.

Senior essay The senior essay provides an appropriate intellectual culmination to the student's work in the major and in Yale College. The essay should ordinarily be written on a topic in an area in which the student has previously done course work, and an effort should be made to demonstrate how the student's work relates to broader

topics, issues, and approaches within the discipline of political science. It should rest on extensive research that is appropriate to the subject matter. Essays are expected to be in the range of 25–30 double-spaced pages. At the beginning of the term in which the essay is written, students must have their senior essay topic approved by a faculty member who has agreed to advise them. Each student is expected to consult regularly with the seminar instructor or adviser and take the initiative in developing a plan of research, scheduling regular meetings, and submitting preliminary drafts for review.

One-term essays may be written either in a seminar or, with the approval of an adviser and the DUS, in PLSC 480. Senior essays written in the fall term are due on December 6, 2019. Spring-term and yearlong essays are due on April 21, 2020. More extensive information about the senior essay can be found on the department website.

Yearlong senior essay Students who wish to undertake a more extensive research project than is possible in a single term may fulfill the senior essay requirement by enrolling in the yearlong course sequence PLSC 490 and 491. PLSC 490 also counts toward the senior seminar requirement. In the fall term, students writing a yearlong senior essay develop a research prospectus for the essay and begin their research under the supervision of a member of the faculty who specializes in the area being investigated. In the spring term, students complete the essay. Yearlong senior essays are expected to be substantially longer than a regular term paper. While there is no fixed length, they are normally at least fifty pages long.

Majors who wish to enroll in the yearlong senior essay must apply for admission in the spring of their junior year. The deadline for the Class of 2021 is April 6, 2020. By that date, students should submit to the office of the director of undergraduate studies: (1) the yearlong senior essay prospectus form signed by a faculty adviser who has agreed to supervise the student during both terms of the senior year; and (2) a one- to two-page statement describing the research project. It is expected that no more than fifteen students will be admitted each year.

ADVISING

The DUS and other members of the department can provide advice about departmental requirements, options within the major, requirements of two majors, study abroad, and other matters related to the major. Majors must secure written approval of their course selections each term from the DUS. All subsequent changes in a student's major program must also be approved. Although advisers (beyond the DUS and the senior essay adviser) are not formally assigned, students are encouraged to seek advice from other departmental faculty members who are knowledgeable about their fields of interest. Information on faculty interests can be found on the department website.

Combined B.A./M.A. degree program Exceptionally able and well-prepared students may complete a course of study leading to the simultaneous award of the B.A. and M.A. degrees after eight terms of enrollment. See Academic Regulations, section K, Special Arrangements, "Simultaneous Award of the Bachelor's and Master's Degrees." Interested students should consult the DUS prior to the sixth term of enrollment for specific requirements in Political Science.

STUDY ABROAD

Students who study in a junior term abroad program or at another university during the summer may, with the approval of the DUS, count up to two courses toward the

major. Students who study in a junior year abroad program may, with the approval of the DUS, count up to four courses toward the major. Students may also petition to have non-Yale courses that were not taught in political science departments count toward the major. Pending approval of the DUS, these courses will count toward the maximum number of substitutions.

REQUIREMENTS OF THE MAJOR

B.A. DEGREE, STANDARD PROGRAM

Prerequisites None

Number of courses *Standard major*—12 term courses; *intensive major*—15 term courses

Distribution of courses 2 courses in each of 3 of the 5 departmental fields; 2 PLSC sems, 1 in senior year

Substitution permitted 2 courses from other depts with DUS approval

Senior requirement 1-term senior essay in sem or in PLSC 480; or 2-term senior essay in PLSC 490, 491

Intensive major PLSC 474 in spring term of junior year; 2-term senior essay in PLSC 490, 493

B.A. DEGREE, INTERDISCIPLINARY CONCENTRATION

Prerequisites None

Number of courses *Standard major with interdisciplinary concentration*—12 term courses; *intensive major with interdisciplinary concentration*—15 term courses

Distribution of courses 7 courses in concentration; 2 courses in each of 2 of the 5 departmental fields; 2 PLSC sems, 1 in senior year

Substitution permitted 3 courses from other depts with DUS approval (2 courses from other depts with DUS approval for intensive major)

Senior requirement 1-term senior essay in sem or in PLSC 480; or 2-term senior essay in PLSC 490, 491; both options on subject within concentration

Intensive major PLSC 474 in spring term of junior year; 2-term senior essay in PLSC 490, 493 on subject within concentration

FACULTY OF THE DEPARTMENT OF POLITICAL SCIENCE

Professors Bruce Ackerman, Akhil Amar, Seyla Benhabib, Paul Bracken, David Cameron, Benjamin Cashore, Bryan Garsten, Alan Gerber, Jacob Hacker, Oona Hathaway, Gregory Huber, Joseph LaPalombara (*Emeritus*), Jeffrey Macris (Visiting Professor), Isabela Mares, David Mayhew (*Emeritus*), Gerard Padro, Thomas Pogge, John Roemer, Susan Rose-Ackerman, Frances McCall Rosenbluth, Bruce Russett (*Emeritus*), James Scott, Ian Shapiro, Stephen Skowronek, Steven Smith, Milan Svoblik, Peter Swenson, John Wargo, Ebonya Washington, Steven Wilkinson, Elisabeth Wood

Associate Professors Peter Aronow, Deborah Beim, Sarah Bush, Ana De La O, Alexandre Debs, Hélène Landemore, Jason Lyall, Karuna Mantena, Nuno Monteiro, Kelly Rader

Assistant Professors Katharine Baldwin, Daniela Cammack, Alexander Coppock, Allison Harris, John Henderson, Joshua Kalla, Sarah Khan, Christina Kinane, Daniel Mattingly, Elizabeth Nugent, Giulia Oskian, Tyler Pratt, Didac Queralt, Thania Sanchez, Fredrik Savje, Emily Sellars, Ian Turner

Senior Lecturers Boris Kapustin, Steven Latham, David Simon

Lecturers Andrea Aldrich, Paris Aslanidis, Leanna Barlow, Steven Calabresi, John DeStefano, Amir Fairdosi, Michael Fotos, Thomas Graham, Maria Jose Hierro, Jane Karr, Brian Libgober, Nicholas Lotito, Nilakshi Parndigamage, Alexander Rosas, Walter Shapiro, Derek Slap, James Sleeper, Bonnie Weir, Graeme Wood

Introductory Courses

*** PLSC 028a, American Constitutionalism: Power and its Limits** Gordon Silverstein
What happens when a modern superpower tries to govern itself under an 18th Century Constitution? Using original documents, contemporaneous books, and U.S. Supreme Court cases, this course explores the debates that have defined America's struggle to live up to its sometimes conflicting commitments to liberty, equality and the consent of the governed. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SO

PLSC 111b / GLBL 268b, Introduction to International Relations Nicholas Lotito
Survey of key debates and concepts in international relations. Exploration of historical and contemporary issues using Western and non-Western cases and evidence. Topics include the rise of states; causes, conduct, and outcomes of wars; the emergence of new actors and forms of conflict; and evolution of global economy. SO

PLSC 113a, Introduction to American Politics Christina Kinane
Introduction to American national government. The Constitution, American political culture, civil rights, Congress, the executive, political parties, public opinion, interest groups, the media, social movements, and the policy-making process. SO

PLSC 114a, Introduction to Political Philosophy Hélène Landemore
Fundamental issues in contemporary politics investigated through reflection on classic texts in the history of political thought. Emphasis on topics linked to modern constitutional democracies, including executive power, representation, and political parties. Readings from Plato, Machiavelli, Hobbes, Locke, Rousseau, Madison and Hamilton, Lincoln, and Tocqueville, in addition to recent articles on contemporary issues. SO

PLSC 116a, Comparative Politics: States, Regimes, and Conflict David Simon
Introduction to the study of politics and political life in the world outside the United States. State formation and nationalism, the causes and consequences of democracy, the functioning of authoritarian regimes, social movements and collective action, and violence. SO

PLSC 118b, The Moral Foundations of Politics Ian Shapiro
An introduction to contemporary discussions about the foundations of political argument. Emphasis on the relations between political theory and policy debate (e.g., social welfare provision and affirmative action). Readings from Bentham, Mill, Marx, Burke, Rawls, Nozick, and others. SO

International Relations

PLSC 121a / MMES 121a, International Relations of the Middle East Nicholas Lotito
This course explores the multiple causes of insecurity in the Middle East and North Africa, a region of paramount geostrategic interest, whose populations have suffered from armed conflicts both within and across national borders. The first half of the course interrogates traditional security concepts like war, terrorism, and revolution, as

well as the political, economic, and social contexts which give rise to these phenomena. The course then turns to foreign policy analysis in case studies of the region's major states. Previous coursework in international relations and/or Middle East politics or history recommended but not required. SO

*** PLSC 123a, Political Economy of Foreign Aid** Peter Aronow

Introduction to modern quantitative research methods in international political economy, with a focus on empirical evidence related to foreign aid. The state of knowledge regarding the effects of development assistance on democratization, governance, human rights, and conflict. The challenges of drawing causal inferences in the domain of international political economy. SO

*** PLSC 135b / AFST 135b, Media and Conflict** Graeme Wood

The theory and practice of reporting on international conflict and war, and its relation to political discourse in the United States and abroad. Materials include case studies of media coverage of war in Europe, Africa, and the Middle East.

*** PLSC 137a or b / GLBL 274a or b, Terrorism** Bonnie Weir

Theoretical and empirical literature used to examine a host of questions about terrorism. The definition(s) of terrorism, the application of the term to individuals and groups, the historical use and potential causes of terrorism, suicide and so-called religious terrorism, dynamics within groups that use terrorism, and counterterrorism strategies and tactics. Theoretical readings supplemented by case studies. SO

*** PLSC 140b / GLBL 381b, Military Power** Nuno Monteiro

The foundations, applications, evolution, and limits of military power. Reading of Clausewitz's *On War* in conjunction with contemporary works. Issues include civil-military relations, military power and political influence, coercion, small wars, occupation and insurgency, and the revolution in military affairs. WR, SO

PLSC 149a / EVST 292a / GLBL 217a, Sustainability in the Twenty-First Century:

Environment, Energy, and the Economy Daniel Esty

Sustainability as a guiding concept for addressing twenty-first century tensions between economic, environmental, and social progress. Using a cross-disciplinary set of materials from the “sustainability canon,” students explore the interlocking challenges of providing abundant energy, reducing pollution, addressing climate change, conserving natural resources, and mitigating the other impacts of economic development. SO

*** PLSC 152a / EP&E 245a, Global Firms and National Governments** Joseph

LaPalombara

Interactions between large-scale firms that make international investments and policy makers and government officials in the “host” countries. National and subnational officials who work to attract investments (or not) and who set policies regulating global firms and their investments. Focus on less-developed countries. Theories as to why firms “globalize”; case studies of controversies created by overseas corporate investments; the changing economic landscape associated with investments by countries such as China, Brazil, and India. SO

*** PLSC 161a / GLBL 344a / HIST 483Ja, Studies in Grand Strategy II** Beverly Gage

The study of grand strategy, of how individuals and groups can accomplish large ends with limited means. During the fall term, students put into action the ideas studied in the spring term by applying concepts of grand strategy to present day issues.

Admission is by application only; the cycle for the current year is closed. This course does not fulfill the history seminar requirement, but may count toward geographical distributional credit within the History major for any region studied, upon application to the director of undergraduate studies. Prerequisite: PLSC 321. Previous study courses in political science, history, global affairs, or subjects with broad interdisciplinary relevance encouraged. SO

*** PLSC 162b, Japan and the World** Frances Rosenbluth

The historical development of Japan's international relations since the late Tokugawa period; World War II and its legacy; domestic institutions and foreign policy; implications for the United States; and interactions between nationalism and regionalism. SO

PLSC 166b, The New Europe David Cameron

European politics since World War II, with emphasis on postwar geopolitical settlement, the development of the European Community and Union, the demise of the Soviet Union and other communist regimes, and current challenges facing Europe. SO

*** PLSC 167b / GBL 284b, Mass Atrocities in Global Politics** David Simon

Examination of the impact of global politics and institutions on the commission, execution, prevention, and aftermath of mass atrocities. SO

PLSC 172a, Strategy, Technology, and War Paul Bracken

This course deals with the strategic management of technology and innovation in the highly dynamic national security space. As more new technologies (cyberwar, ASAT, drones, AI, quantum computing, hypersonic missiles, nuclear weapons) come into military postures a major technological arms race has come about. Strat Tech covers the new technologies; competitive strategies in Europe and Asia; and foreign investment in the US technology sector. Silicon Valley and the Pentagon, and global technology companies receive special focus. SO

*** PLSC 178a, U.S.–Mexico Relations** Emily Sellars

Introduction to U.S.–Mexico relations. Historical background on the bilateral relationship. Discussion of contemporary political issues, including trade, border security, the drug war, migration, agriculture, environmental issues, and energy policy.

PLSC 182b / GBL 236b, The Politics of International Law and Cooperation Tyler Pratt

This course focuses on the political processes and institutions that facilitate cooperation among states. Students examine the obstacles to cooperation in the international arena, the reasons for the creation of international laws and institutions, and the extent to which such institutions actually affect state policy. Students also explore the tension between international cooperation and concerns about power, state sovereignty, and institutional legitimacy. Course materials draw from a variety of substantive issues, including conflict prevention, trade, human rights, and environmental protection. SO

PLSC 191b / PHIL 180b, Ethics and International Affairs Thomas Pogge

Moral reflection taken beyond state boundaries. Traditional questions about state conduct and international relations as well as more recent questions about intergovernmental agencies, nongovernmental organizations, and the design of global institutional arrangements. HU

American Government

PLSC 205a, Law, Leadership, and the Political Development of the American Presidency Stephen Skowronek

Examination of the constitutional law, historical development, and current operations of the American presidency. Topics include formal powers, the organization and mobilization of popular support, the modern executive establishment, and the politics of presidential leadership. SO

* **PLSC 209a / HIST 167Ja / PLSC 839, Congress in the Light of History** David Mayhew

This course begins by studying analytic themes, including congressional structure, incentives bearing on members and parties, conditions of party control, supermajority rules, and polarization, followed by narrative works of major political showdowns entailing Congress such as those in 1850, 1876–77, 1919 (defeat of the Versailles Treaty), 1937 (defeat of court-packing), 1954 (the McCarthy-Army hearings), 1964 (civil rights), 1973–74 (Watergate), and 1993–94 (defeat of health care). Students also examine a series of policy performances, for the better or the worse in today's judgments, ranging from early state-building through reacting to the Great Depression, constructing a welfare state, and addressing climate change. This is a reading course and does not accommodate senior essays. SO

* **PLSC 212a / EP&E 390a / EVST 212a, Democracy and Sustainability** Michael Fotos
Democracy, liberty, and the sustainable use of natural resources. Concepts include institutional analysis, democratic consent, property rights, market failure, and common pool resources. Topics of policy substance are related to human use of the environment and to U.S. and global political institutions. WR, SO

PLSC 214b, The Politics of American Public Policy Jacob Hacker

Public policy in the United States and the methodological and theoretical tools used to study the forces that shape it. Economic and political science perspectives on the policy process and contemporary American governance. Domestic policy issues such as health care, economic inequality, job insecurity, the federal debt, environmental protection, criminal justice, financial regulation, and primary and higher education. SO

* **PLSC 219b / EP&E 497b / EVST 247b, Politics of the Environment** Peter Swenson
Historical and contemporary politics aimed at regulating human behavior to limit damage to the environment. Goals, strategies, successes, and failures of movements, organizations, corporations, scientists, and politicians in conflicts over environmental policy. Focus on politics in the U.S., including the role of public opinion; attention to international regulatory efforts, especially with regard to climate change. SO

* **PLSC 220a / PLSC S220 / WGSS 220a, Gender Politics** Andrea Aldrich
Exploration of theoretical and empirical work in political science to study the relationship between gender and politics in the United States and around the world. Topics include women's representative in legislative and executive branch politics in democratic regimes; the impact of gender stereotypes on elections and public opinion; conditions that impact the supply and demand of candidates across genders; and the underrepresentation of women in political institutions. WR, SO

* **PLSC 223a / EDST 223a, Learning Democracy: The Theory and Practice of Civic Education** Amir Fairdosi

This is a seminar on the theory and practice of civic education. We begin by investigating philosophies of civic education, asking such questions as: What is civic education and what is its purpose? What knowledge, skills, and values promote human flourishing and the cultivation of a democratic society? What role can and should schools play in this cultivation? In the next part of the course we focus on civic education in practice, exploring various approaches to teaching civics and the empirical evidence in support of each method's effectiveness. We also discuss variations in access to civic education opportunities across socioeconomic, demographic, and national contexts, and how societies might deal with these disparities. SO

* **PLSC 224b, Political Leadership** Stephen Skowronek

Examination of political leadership as both a concept and a practice. Survey of classic works by Machiavelli, Carlyle, Weber, Lenin, and Schumpeter. Consideration of the difference between transformational leadership and transactional leadership, and between executive leadership and reform leadership. Issues include the conundrum of "democratic leadership" and the role of narrative in leadership. WR, SO

* **PLSC 228a / EP&E 306a, First Amendment and Ethics of Law** Karen Goodrow

This course addresses the First Amendment and freedom of speech, focusing on the ethical implications of restrictions on free speech, as well as the exercise of free speech. Course topics and discussions include the "fighting words" doctrine, hate speech, true threats, content regulated speech, freedom of speech and the internet, and the so-called "right to be forgotten." By the end of the course, students recognize the role free speech plays in society, including its negative and positive impacts on various segments of society. Students also have an understanding of the competing interests arising from the First Amendment's right to free speech, and can analyze how these competing interests are weighed and measured in the United States as compared with other countries. SO

PLSC 233a, Constitutional Law Akhil Reed Amar

An introduction to the main themes of the American Constitution – popular sovereignty, separation of powers, federalism, and rights – and to basic techniques of constitutional interpretation. Special emphasis on the interplay of constitutional text, judicial doctrine, and constitutional decision making outside the judiciary. SO

* **PLSC 235a, Political Journalism and Public Policy** Derek Slap

The effects of political journalism on American public policy from 1960 to the present. Focus on changes in the media during the past few decades. The Dewey-Lippmann debate on the role journalism should play in politics, marketing in the 1968 presidential campaign, broadcast news and audience fragmentation in the 1970s, media dysfunction and the Clinton and Obama health care initiatives, the Internet, hyperpartisanship, media bias, and recent gun control initiatives. SO

* **PLSC 236b, Presidential Campaigns and the Media** Walter Shapiro

The intersection of two institutions in the midst of major transformations – the political campaign industry and the news business. Presidential campaign coverage during the last third of the twentieth century; the beleaguered economic structure of the news business in the twenty-first century; media coverage of the 2008 and 2012 presidential

racism, with emphasis on how campaigns adapted to the changed news landscape and to new ways of communicating with voters. SO

* **PLSC 237b, Persuasion and Political Communication** John Henderson

The history of political communication, persuasion, and demagoguery in the American political tradition, from the design and ratification of the Constitution to modern debates over terrorism and authoritarianism. The limits of democratic deliberation and representation; elite communication strategies that influence policy making and elections. SO

* **PLSC 238a / EDST 238a, Policy, Politics, and Learning on the Education Beat** Jane Karr

Exploration of the national conversation around education issues, and how to write smartly about them. Classes delve into top stories of the last few years—diversity and desegregation, school choice and culture wars—and their impact on policy. Students learn to develop strong, marketable ideas while crafting features aimed at publication. Journalists on the K-12 beat are frequent guests. WR, SO

* **PLSC 241a / SOCY 365a, The Making of Political News** Matthew Mahler

The processes through which political news gets made. How the form and content of political news are shaped in and through the ongoing relationships between political operatives and journalists; ways in which these actors attempt to structure and restructure such relationships to their benefit. SO

PLSC 242b / RLST 118b, Biblical and Constitutional Interpretation in Dialogue

Maria Doerfler

How people read important books. Study of the strategies used throughout history to interpret two of the most authoritative texts: the bible and the U.S. Constitution. Different exegetes and exegetical communities continue to disagree on ways to read these books, and on how these readings should shape thought, practice, and national policy. Case studies include discussion of proper relations between civic and religious communities; the issue of slavery; and the topic of same-sex marriage. WR, HU

* **PLSC 244b / EP&E 324b, Journalism, Liberalism, Democracy** James Sleeper

The news media's role in configuring the democratic public sphere, from the early synergy of print capitalism and liberalism through the corporate consolidation of mass media and the recent fragmentation and fluidity of "news." Classical-humanist and civic-republican responses to these trends. SO

* **PLSC 253a or b / ENGL 467a or b, Journalism** Staff

Examination of the practices, methods, and impact of journalism, with focus on reporting and writing; consideration of how others have done it, what works, and what doesn't. Students learn how to improve story drafts, follow best practices in journalism, improve methods for obtaining, skeptically evaluating, and assessing information, as well as writing a story for others to read. The core course for Yale Journalism Scholars. No prerequisites. WR

PLSC 254a, Political Parties in the American System John Henderson

The evolution of American political parties and the role of parties and partisanship in contemporary government and elections. Empirical and theoretical accounts of parties, including divided government, parties in Congress, realignment, responsible party

government, party identification, and ideology. Elite-led polarization, decline and resurgence of strong parties, and the antiparty constitutional tradition. SO

*** PLSC 256b / EP&E 248b, American Political Institutions** Michael Fotos

The origins and development of American political institutions, especially in relation to how institutions shape the policy process. Issues of temporality, policy feedback, and policy substance. WR, SO

PLSC 257b, Bioethics and Law Stephen Latham

The treatment by American law of major issues in contemporary biomedical ethics: informed consent, assisted reproduction, abortion, end-of-life care, research on human subjects, stem cell research, and public health law. Readings include legal cases, statutes, and regulations. No background in law assumed. SO

PLSC 262a / AMST 209a / ER&M 223a, Race, Politics, and the Law Daniel HoSang

Examination of how race – as a mode of domination and resistance – has developed and transformed in the United States since the early-twentieth-century. How political actors and social movements engage the law to shape visions of freedom, democracy, and political life. Consideration of critical race theory, political discourse analysis, intersectionality and women of color feminism, and American political development. SO

PLSC 270a, Capitalism in America Douglas Rae

This course offers an overview of the capitalist political economy which has structured life in the United States since colonial times. A major theme concerns the creation (and sometimes destruction) of wealth and income, along with their distribution across social classes, regions, and generations. Firms given substantial attention include Amazon, Google, Walmart, Merck, Tesla, and Ford Motors. Public institutions considered include the FDA, the NLRB, the Federal Reserve, the U.S. Patent & Trademark Office, and the Federal Trade Commission. None. SO

*** PLSC 273b / EP&E 339b, The Ethics of Journalism** Jacob Weisberg

An examination of key issues about the rights and responsibilities of the press. Topics include truth and verification, bias and objectivity, the handling of government secrets, the use of misrepresentation and deception, privacy, and the protection of sources. Case studies including WikiLeaks and the Pentagon Papers will supplement readings from critics such as Walter Lippmann, George Orwell, Janet Malcolm, and Neil Postman.

*** PLSC 274a, Cities: Making Public Choices in New Haven** John DeStefano

Examination of cities, particularly the relationship of people to place and most importantly to one another, through the prism and experiences of the City of New Haven. Exploration of how concepts of social capital and legitimacy of institutions in policy design and execution, are key to the well being of community residents. How cities, in the context of retreating or antagonistic strategies by the state and federal governments, can be key platforms for future economic and social wealth creation. SO

*** PLSC 276b / SOCY 238b, Wrongful Convictions in Law and Politics** Nilakshi Parndigamage

This course will examine the problem of wrongful convictions and the various political and social factors that result in innocent people being convicted of serious crimes. Topics include eye-witness misidentifications, unreliable forensic science, false confessions, jailhouse informants, prosecutorial and law enforcement misconduct, race

and gender, criminal justice reform, and varied approaches to wrongful convictions across the world. SO

* **PLSC 278b, Politics and the Supreme Court** Kelly Rader

The role of the U.S. Supreme Court in the American political system. Ways in which the political preferences of Congress, the President, and the American public shape, constrain, or compel the Court's decision making. Supreme Court justices as political actors who issue decisions that make policy. SO

Political Philosophy

* **PLSC 283a / EP&E 235a / PHIL 457a, Recent Work on Justice** Thomas Pogge

In-depth study of one contemporary book, author, or debate in political philosophy, political theory, or normative economics. Focus varies from year to year based on student interest and may include a ground-breaking new book, the life's work of a prominent author, or an important theme in contemporary political thought. HU

* **PLSC 286a / HIST 286J / HIST 292Ja / HUMS 279a, Democracy and the French Revolution** Isaac Nakhimovsky

The French Revolution of 1789 and its legacies, as viewed through the late-eighteenth-century debates about democracy, equality, representative government, and historical change that shaped an enduring agenda for historical and political thought in Europe and around the world. WR, HU

PLSC 290a / SOCY 151a, Foundations of Modern Social Theory Emily Erikson

Major works of social thought from the beginning of the modern era through the 190s. Attention to social and intellectual concepts, conceptual frameworks and methods, and contributions to contemporary social analysis. Writers include W.E.B. Du Bois, Simone De Beauvoir, Adam Smith, Thomas Hobbes, Jean-Jacques Rousseau, Immanuel Kant, Emile Durkheim, Max Weber, and Karl Marx. SO

* **PLSC 291b / PHIL 464b, Justice, Taxes, and Global Financial Integrity** Thomas Pogge

Study of the formulation, interpretation, and enforcement of national and international tax rules from the perspective of national and global economic justice. Previous courses in one or two of the following: law, economics, political science, or political philosophy. HU

* **PLSC 297a / EP&E 312a, Moral Choices in Politics** Boris Kapustin

A study of how and why people make costly moral choices in politics. Figures studied include Thomas More, Abraham Lincoln, Nelson Mandela, Václav Havel, and Aung San Suu Kyi. SO

* **PLSC 305b / EP&E 353b, Critique of Political Violence** Boris Kapustin

Methods of conceptualizing political violence that are prevalent in contemporary political philosophical discourse. Use of theoretical-analytical tools to examine the modes violence assumes and the functions it performs in modern political life as well as the meanings and possibilities of nonviolence in politics. SO

* **PLSC 307a / HUMS 295a / JDST 223a, Trials of Uncertainty** Norma Thompson

Is the demise of the trial at hand? The trial as cultural achievement, considered as the *epitome* of humanistic inquiry, where all is brought to bear on a crucial matter in an uncertain context. Truth may be hammered out or remain elusive, but the expectation

in the court case has been that the adversarial mode works best for sorting out evidentiary conundrums. Inquiries into issues of meaning of the trial, its impartiality, and challenges to its durability. The role of character, doubt, and diagnosis explored in Sophocles, Plato, Cicero, Burke, Jane Austen, Tocqueville, and Kafka, as well as in twentieth-century trials, films, documentaries, and twenty-first-century medical narratives. WR, HU

* **PLSC 312a, Punishment** Alexander Rosas

This course is about punishment. The power of the state to restrict freedom, to impose pain, even death, and to mark one as 'criminal' is remarkable, and this course interrogates the theories that underlie that power. In what cases and for what reasons should the state have the power to punish, and where should the moral and legal limits on that power lie? What should the goals of punishment be, and which forms of punishment align most closely with them? What is the nature and desired role of vengeance and mercy in determining whether, when, and how to punish? What obligations should a society have to punish but also to those whom it punishes? Should the state have the power to shame and humiliate? What does punishment reveal about society more broadly? This course considers these and other related questions primarily through works in political and legal theory, but it also takes an interdisciplinary approach and elaborates and evaluates the theoretical materials through a discussion of numerous legal and other case studies. SO

* **PLSC 313a / EP&E 380a, Bioethics, Politics, and Economics** Stephen Latham

Ethical, political, and economic aspects of a number of contemporary issues in biomedical ethics. Topics include abortion, assisted reproduction, end-of-life care, research on human subjects, and stem cell research. SO

* **PLSC 314a / HUMS 351a, The American Imagination: From the Puritans to the Civil War** Steven Smith and Anthony Kronman

Interdisciplinary examination of the uniqueness of the American experience from the time of the Puritans to the Civil War. Readings draw on major works of political theory, theology, and literature. HU

PLSC 317b / EP&E 315b, Constitutionalism Giulia Oskian

An introduction to the political philosophy of constitutionalism combined with a trans-historical and comparative study of constitution-making processes including the US, France, Mexico, Germany, Italy, and India.

* **PLSC 320b / EP&E 421b, Ethics, Law, and Current Issues** Karen Goodrow

Examination of how freedom of speech and bias influence the criminal justice system, focusing on wrongful convictions and administration of the death penalty. Understanding the role of potential bias at various levels and the competing interests of protecting speech, due process, and the innocent. Topics include limitations on speech, practical effects of speech, the efficacy of the death penalty, actual innocence, gender/race/economic bias and its effects on the justice system, as well as best practices for improving our sense of justice.

* **PLSC 321b / GBLB 342b / HIST 482Jb, Studies in Grand Strategy I** Beverly Gage

The study of grand strategy, of how individuals and groups can accomplish large ends with limited means. The spring term focuses on key moments in history that illustrate strategic thinking in action. During the summer, students undertake research projects or internships analyzing strategic problems or aspects of strategy. The

following fall, students put their ideas into action by applying concepts of grand strategy to present day issues. Admission is by application only; the cycle for the current year is closed. This course does not fulfill the history seminar requirement, but may count toward geographical distributional credit within the History major for any region studied, upon application to the director of undergraduate studies. Previous study courses in political science, history, global affairs, or subjects with broad interdisciplinary relevance encouraged. HU, SO

*** PLSC 327b, Advanced Topics in Modern Political Philosophy** Steven Smith
Advanced survey of modern political philosophy. Focus on democracy and inequality from Rousseau to Marx. The identity of the modern representative republic, the nature of capitalism or commercial society, and the relation between the two. Close analysis of the writings of Rousseau, Smith, and Marx. Prerequisite: substantial course work in intellectual history and/or political theory. HU, SO

*** PLSC 338a, Wahhabism: Politics, History, & Ethics** Jeffrey Macris
This course aims to explore the politics, history, and ethical claims of the Wahhabi Islamic movement, from its origins on the Arabian Peninsula in the 18th century to today. SO

Analytical Political Theory

*** PLSC 341b / GBLB 195b, The Logic of Randomized Experiments in Political Science**
Alexander Coppock

Instruction in the design, execution, and analysis of randomized experiments for businesses, nonprofits, political organizations, and social scientists. Students learn to evaluate the impact of real-world interventions on well-defined political, economic, and social outcomes. Specific focus on randomized experimentation through field and survey experiments, with design and analysis principles extending to lab and so-called "natural" experiments. Any introductory probability or statistics course. QR

PLSC 344a / EP&E 295a, Game Theory and Political Science Ian Turner
Introduction to game theory—a method by which strategic interactions among individuals and groups in society are mathematically modeled—and its applications to political science. Concepts employed by game theorists, such as Nash equilibrium, subgame perfect equilibrium, and perfect Bayesian equilibrium. Problems of cooperation, time-consistency, signaling, and reputation formation. Political applications include candidate competition, policy making, political bargaining, and international conflict. No prerequisites other than high school algebra. Political Science majors who take this course may not count ECON 159 toward the major. QR, SO

Comparative Government

*** PLSC 347b / EP&E 328b / S&DS 172b, YData: Data Science for Political Campaigns**
Joshua Kalla

Political campaigns have become increasingly data driven. Data science is used to inform where campaigns compete, which messages they use, how they deliver them, and among which voters. In this course, we explore how data science is being used to design winning campaigns. Students gain an understanding of what data is available to campaigns, how campaigns use this data to identify supporters, and the use of experiments in campaigns. This course provides students with an introduction to political campaigns, an introduction to data science tools necessary for studying

politics, and opportunities to practice the data science skills presented in S&DS 123, YData.

Prerequisite: S&DS 123, which may be taken concurrently. QR ½ Course cr

* **PLSC 354a / EP&E 250a, The European Union** David Cameron

Origins and development of the European Community and Union over the past fifty years; ways in which the often-conflicting ambitions of its member states have shaped the EU; relations between member states and the EU's supranational institutions and politics; and economic, political, and geopolitical challenges. so

* **PLSC 358b / PLSC 722b, Comparative Political Parties and Electoral Systems**

Andrea Aldrich

This course explores democratic representative through political parties around the world and the effects of electoral systems on party system development. In doing so, we critically examine the role of political parties in the representation of societal interests, party system evolution, the consequences of electoral law, and challenges facing modern political parties today with a particular focus on the growth of authoritarian and far right parties around the world. Prerequisite: It is helpful, although not mandatory, to have taken Intro to American Politics and Intro to Comparative Politics. A course on research design in the Social Sciences is also helpful. so

* **PLSC 366b, European Politics** David Cameron

Comparison of the political systems of the major European countries. Topics include political institutions, electoral politics and political parties, public policies, and contemporary problems. so

* **PLSC 367b, Contemporary Spanish Politics** Maria Jose Hierro

During the second part of 2017 and the first part of 2018, Spanish politics has been in turmoil. Today, a new central government is in power. What will be the consequences of this change in everyday Spanish politics? In this seminar, we consider contemporary problems in Spanish politics and we study these problems in comparative perspective. Topics include secession, transitional justice, corruption, terrorism, institutional crisis, and populism. so

PLSC 369b / CPSC 210b, Power, Security, and Surveillance: Political Challenges of the Computer Age Steven Wilkinson and Joan Feigenbaum

Twenty-first century societies are faced with both threats and opportunities that combine sophisticated computation with politics and international relations in critical ways. Examples include cyber warfare; cyber espionage; cyber crime; the role of social media in democratic self-governance, authoritarian control, and election "hacking"; cryptocurrencies; and mass surveillance. This course examines the political challenges wrought by massive increases in the power of computational and communication technologies and the potential for citizens and governments to harness those technologies to solve problems. It is co-taught by one faculty member in computer science and one in political science. No previous programming experience required. Meets with CPSC 310. Students may earn credit for CPSC 210/PLSC 369 or for CPSC 310; not for both. Prerequisite: Internet literacy. so

*** PLSC 376b / ER&M 376b / MGRK 304b / SOCY 307b, Extreme and Radical Right Movements** Paris Aslanidis

Extreme and radical right movements and political parties are a recurrent phenomenon found in most parts of the world. Discussion of their foundational values and the causes of their continuous, even increasing, support among citizens and voters. SO

PLSC 378b / AFAM 186b / LAST 214b / SOCY 170b, Contesting Injustice Elisabeth Wood

Exploration of why, when, and how people organize collectively to challenge political, social, and economic injustice. Cross-national comparison of the extent, causes, and consequences of inequality. Analysis of mobilizations for social justice in both U.S. and international settings. Intended primarily for freshmen and sophomores. SO

PLSC 381b / AFST 381b, Government and Politics in Africa Katharine Baldwin

The establishment and use of political power in selected countries of tropical Africa. The political role of ethnic and class cleavages, military coups, and the relation between politics and economic development. SO

PLSC 382b, Introduction to Latin American Politics Emily Sellars

Introduction to major theories of political and economic change in Latin America, and to the political and economic systems of particular countries. Questions include why the continent has been prone to unstable democratic rule, why countries in the region have adopted alternatively state-centered and market-centered economic models, and, with the most recent wave of democratization, what the remaining obstacles might be to attaining high-quality democracy. SO

*** PLSC 393a, Comparative Constitutionalism and Legal Institutions** Steven Calabresi

Introduction to the field of comparative constitutional law. Constitutional texts, materials, and cases drawn primarily from those constitutional democracies that are also members of the Group of Twenty Nations and that respect judicial independence. SO

*** PLSC 398b / EP&E 253b, Comparative Political Economy** Frances Rosenbluth

Introduction to issues in political economy across time and place. The field's diverse theoretical underpinnings and its place in the context of political science and of the social sciences more generally; theoretical perspectives such as materialism, institutionalism, and cognition/culture/beliefs; interactions between government and the economy in democratic and nondemocratic regimes and in developed and developing countries. Enrollment limited to senior Political Science majors. SO

PLSC 400a / RSEE 400a, Legacies of Communism and Conflict in Europe Andrea Aldrich

This course examines the challenges of democratic transition and consolidation in Europe in an exciting way using contemporary and historical political research, documentary and dramatic film, a graphic non-fiction novel, and a field trip to MOMA in NYC (optional). Together we explore political themes like authoritarianism, state collapse, nationalism, ethnic conflict, transitional justice, and democratic development through the turbulent political history of Southeastern Europe, which provides a solid theoretical foundation for the understanding of past and current events around the world. SO

* **PLSC 401a / AFST 400a / EP&E 499a, Democratic Politics and Public Policy in Contemporary Africa** Jeremy Seekings

Examination of how the resurgence of competitive, multi-party elections in Africa has reinvigorated democratic governance and transformed the process of public policy-making. Emphasis on the political landscape of public opinion and voting behavior; elections and political parties; the state and governance; as well as policy-making, with focus on economic and social policies. SO

PLSC 405a / DEVN 198a / EP&E 329a / GLOBL 444a / HIST 122a, Power and Politics in Today's World Ian Shapiro

A comparative study of power and politics since the Cold War. Topics include the decline of trade unions and increased influence of business; growing inequality and insecurity; changing attitudes towards democracy and authoritarianism; and the character and durability of the new international order. We start with the impact of the USSR's collapse, both in former communist countries and the West, focusing on reordered relations among business, labor, and governments. Next we take up the Washington Consensus on free trade, privatization, and deregulation, and agendas to fight terrorism, prevent human rights abuses, and spread democracy. Then we turn to the backlash that followed the financial crisis, as technocratic elites lost legitimacy, the global war on terror became mired in quagmires, and humanitarian intervention and democracy-spreading agendas floundered. The new politics of insecurity is our next focus. We examine the populist explosions of 2016 and the politics to which they have given rise. This leads to a consideration of responses, where we discuss the policies most needed when congenial employment insecurity is going to be the norm, and the political reforms that would increase the chances of those policies being adopted. Introductory courses in twentieth-century European, American or global history, comparative politics, or political economy are helpful but are not required. HU, SO

* **PLSC 409a / GLOBL 261a, Civil Conflict** Bonnie Weir

Forms of civil conflict and political violence and theories about reasons for and implications of these types of violence. Natural and philosophical foundations of political violence; the potential roles of ethnicity, economic factors, territory, and political institutions and structures in the onset and dynamics of civil conflict; problems of conflict termination.

* **PLSC 410a, Political Protests** Maria Jose Hierro

The study of political protest, with discussion of theoretical approaches explaining the origin and decline of social movements and protest. Topics include the conditions under which individuals coordinate and start protest actions; what favors individual participation in protests; and when do protests succeed. SO

* **PLSC 415b / EP&E 241 / SOCY 172b, Religion and Politics in the World** Katharine Baldwin

A broad overview of the relationship between religion and politics around the world, especially Christianity and Islam. Religions are considered to constitute not just theologies but also sets of institutions, networks, interests, and sub-cultures. The course's principal aim is to understand how religion affects politics as an empirical matter, rather than to explore moral dimensions of this relationship. SO

PLSC 419b, Social Policy Around the World Isabela Mares

This course employs the tools of comparative politics to account the development of social policies in both developed and developing countries. We seek to establish the relative importance of institutional variables, social cleavages, and partisanship in accounting for the variation in policy design. Secondly, we explore the impact of existing social policies on a range of labor market outcomes, including inequality, unemployment, and labor force participation rates. In exploring the recent politics of social policy adjustment, we examine the extent to which strong existing differences among welfare states can endure in the face of unfavorable economic and demographic developments and common political pressures towards welfare state retrenchment. Prerequisite: PLSC 116. SO

* **PLSC 420a / ANTH 406a / EVST 424a, Rivers: Nature and Politics** James Scott
The natural history of rivers and river systems and the politics surrounding the efforts of states to manage and engineer them. SO

* **PLSC 423a / EP&E 243a / GBL 336a / LAST 423a, Political Economy of Poverty Alleviation** Ana De La O
Overview of classic and contemporary approaches to the question of why some countries have done better than others at reducing poverty. Emphasis on the role of politics. SO

PLSC 427a / WGSS 429a, Sex, Markets, and Power Frances Rosenbluth
Consideration of how women's socioeconomic status and political power have varied across time and place. Three analytical lenses are used: biology, markets, and power. SO

* **PLSC 431b / GBL 289b / HIST 245Jb, War and Peace in Northern Ireland** Bonnie Weir
Examination of theoretical and empirical literature in response to questions about the insurgency and uneasy peace in Northern Ireland following the peace agreement of 1998 which formally ended the three-decade long civil conflict known widely as The Troubles and was often lauded as the most successful of its kind in modern history. Consideration of how both the conflict and the peace have been messier and arguably more divisive than most outside observers realize. SO

PLSC 435a / MMES 290a / RLST 290a, Islam Today: Jihad and Fundamentalism Frank Griffel
Introduction to modern Islam, including some historical background. Case studies of important countries in the contemporary Muslim world, such as Egypt, Iran, Pakistan, and Saudi Arabia. Islam as a reactive force to Western colonialism; the ideals of Shari'a and jihad; violence and self-sacrifice; and Islam as a political ideology. HU

PLSC 437a / ER&M 206a / SOCY 223a, The Politics of Ethnic and National Identity Maria Jose Hierro
Introduction to the study of ethnic and national identity, their determinants and consequences in comparative perspective. SO

Statistical and Mathematical Methods

PLSC 452a / EP&E 203a / S&DS 102a, Introduction to Statistics: Political Science

Jonathan Reuning-Scherer

Statistical analysis of politics, elections, and political psychology. Problems presented with reference to a wide array of examples: public opinion, campaign finance, racially motivated crime, and public policy. QR

PLSC 453a / EP&E 209a / S&DS 103a, Introduction to Statistics: Social Sciences

Jonathan Reuning-Scherer

Descriptive and inferential statistics applied to analysis of data from the social sciences. Introduction of concepts and skills for understanding and conducting quantitative research. QR

Advanced Courses

*** PLSC 471a and PLSC 472b, Individual Reading for Majors** David Simon

Special reading courses may be established with individual members of the department. They must satisfy the following conditions: (1) a prospectus describing the nature of the program and the readings to be covered must be approved by both the instructor and the director of undergraduate studies; (2) the student must meet regularly with the instructor for an average of at least two hours per week; (3) the course must include a term essay, several short essays, or a final examination; (4) the topic and/or content must not be substantially encompassed by an existing undergraduate or graduate course. All coursework must be submitted no later than the last day of reading period.

*** PLSC 474b, Directed Reading and Research for Junior Intensive Majors** David Simon

For juniors preparing to write yearlong senior essays as intensive majors. The student acquires the methodological skills necessary in research, identifies a basic reading list pertinent to the research, and prepares a research design for the project. All coursework must be submitted no later than the last day of reading period.

*** PLSC 480a or b, One-Term Senior Essay** David Simon

For seniors writing the senior essay who do not wish, or are unable, to write the essay in a department seminar. Students must receive the prior agreement of a member of the department who will serve as the senior essay adviser, and must arrange to meet with that adviser on a regular basis throughout the term.

*** PLSC 490a or b, The Senior Colloquium** Staff

Presentation and discussion of students' research proposals, with particular attention to choice of topic and research design. Each student frames the structure of the essay, chooses research methods, begins the research, and presents and discusses a draft of the introductory section of the essay. Enrollment limited to Political Science majors writing a yearlong senior essay.

*** PLSC 491b, The Senior Essay** David Simon

Each student writing a yearlong senior essay establishes a regular consultation schedule with a department member who, working from the prospectus prepared for PLSC 490, advises the student about preparation of the essay and changes to successive drafts. Enrollment limited to Political Science majors writing a yearlong senior essay.

* **PLSC 493b, Senior Essay for Intensive Majors** David Simon

Each student in the intensive major establishes a regular consultation schedule with a department member who, working from the prospectus prepared for PLSC 490, advises the student about preparation of the essay and changes to successive drafts, as well as reporting the student's progress until submission of the final essay. Enrollment limited to Political Science intensive majors.

Portuguese

Director of undergraduate studies: K. David Jackson (k.jackson@yale.edu), 82-90 Wall St., 432-1158; span-port.yale.edu

Portuguese is taught at Yale as part of the Department of Spanish and Portuguese.

The major in Portuguese is a liberal arts major intended to develop competence in the Portuguese language and to provide students with a comprehensive knowledge of the literatures and cultures of Portugal, Brazil, and African and Asian lands of Portuguese language or influence.

PREREQUISITES

Students begin the study of Portuguese with PORT 110, 125, or S112. After two years of Portuguese language study, or equivalent, students have sufficient proficiency to take advanced courses in Luso-Brazilian literature and culture.

The prerequisite for the major is PORT 130 or the equivalent.

PLACEMENT PROCEDURES

All students who have not yet taken Portuguese at Yale are expected to take the departmental placement test, with the exception of students who have no previous knowledge of Portuguese whatsoever. The departmental placement test covers reading, writing, speaking, and listening skills. The placement test will be given at the beginning of the fall and spring terms; see the department website for details.

REQUIREMENTS OF THE MAJOR

The requirements of the Portuguese major consist of ten term courses beyond the prerequisites. Students must take at least five term courses in the literatures or cultures of the Portuguese world. In completing their programs, students may elect up to four courses in other languages and literatures, anthropology, history, or history of art, or from study abroad, that are related to their field of study and approved by the director of undergraduate studies (DUS).

SENIOR REQUIREMENT

All majors must present a senior essay. The essay is written in PORT 491 and/or 492. A maximum of two credits counts toward the major.

ADVISING

Juniors and seniors majoring in Portuguese may, with the permission of the instructor and the director of graduate studies, enroll in graduate courses in Portuguese.

REQUIREMENTS OF THE MAJOR

Prerequisite PORT 130 or equivalent

Number of courses 10 term courses beyond prereq (incl senior essay course)

Distribution of courses At least five term courses in literatures or cultures of the Portuguese world

Substitution permitted With DUS permission, up to 4 relevant courses from other depts or from study abroad

Senior requirement Senior essay (PORT 491 and/or 492)

CERTIFICATE OF ADVANCED LANGUAGE STUDY

The Department of Spanish and Portuguese offers a Certificate of Advanced Language Study in Portuguese. A certificate adviser, typically the director of undergraduate studies (DUS), advises students on the certification process and certifies to the University Registrar's Office that students have completed the stated requirements before the end of eight terms of study. The Certificate of Advanced Language Study, once certified, is listed on student transcripts.

REQUIREMENTS

Students seeking to earn the certificate are required to take four courses, all beyond the L4 level in their chosen language, at least two of which must be Yale courses designated as L5. Additionally, at least one of the courses must be a 300-level course (advanced undergraduate lecture or seminar) with course materials read in Portuguese and course work written in Portuguese. All courses must be taken for a letter grade, and students must achieve a grade of B or above. With the approval of the certificate adviser, one advanced non-L5 course, conducted in the target language, such as an independent study course, a graduate seminar, or an advanced seminar may count toward certification requirements.

The adviser may approve the substitution of one credit earned as part of a Yale or Yale-designated study abroad program and taught in the target language to count toward the certificate requirements. If the adviser approves courses taken outside of Yale for inclusion in the certificate requirements, students must take the necessary steps to ensure those courses appear on their transcript.

Credit/D/Fail No courses taken Credit/D/Fail may be counted toward the requirements of the certificate.

FACULTY OF THE DEPARTMENT OF SPANISH AND PORTUGUESE

Professors Rolena Adorno, Howard Bloch (*Chair*), Roberto González Echevarría, Aníbal González, K. David Jackson, Noël Valis

Associate Professor Leslie Harkema

Senior Lectors II Sybil Alexandrov, Margherita Tortora, Sonia Valle

Senior Lectors I María Pilar Asensio-Manrique, Mercedes Carreras, Ame Cividanes, Sebastián Díaz, María de la Paz García, María Jordán, Rosamaría León, Juliana Ramos-Ruano, Lissette Reymundi, Lourdes Sabé-Colom, Virginia Santos, Terry Seymour

Lecturers Marina Henriques Gomes de Andrade, Carolina Baffi, Deborah K. Symons Roldán, Giseli Tordin, María M. Vázquez

Courses

PORT 110a, Elementary Portuguese I Staff

Basic vocabulary and fundamentals of grammar through practice in speaking, reading, and writing, with stress on audio-lingual proficiency. Introduces Brazilian and Portuguese culture and civilization. L1 RP 1½ Course cr

PORT 120b, Elementary Portuguese II Staff

Continuation of PORT 110. To be followed by PORT 130. Prerequisite: PORT 110. L2
1½ Course cr

PORT 130a, Intermediate Portuguese I Staff

Contemporary and colloquial usage of Portuguese in the spoken and written language of Brazil. Grammar review and writing practice. Readings on Brazilian society and history are used to build vocabulary. Exercises develop students' oral command of the language. L3 RP 1½ Course cr

PORT 140b, Intermediate Portuguese II: Portuguese Through the Arts Staff

Continuation of PORT 130. Grammar review, conversation, cultural topics, and readings from Brazilian literature. Concentration on varieties of artistic and cultural expression. Counts for the major in Portuguese. Prerequisite: PORT 130. L4
1½ Course cr

*** PORT 150a or b, Advanced Practice in Portuguese** Staff

Advanced conversation and composition, with an introduction to Luso-Brazilian literature and culture. After PORT 140 or equivalent. May be repeated for credit. L5
RP

*** PORT 350a / LITR 252a, Machado de Assis** K. David Jackson

The place of Machado de Assis in world literature explored through close reading of his nine novels and selected stories in translation. Machado's hybrid literary world, skeptical critique of empire in Brazil, and narrative constructions. Readings and discussion in English; reading of texts in Portuguese for Portuguese majors. WR, HU
TR

*** PORT 360a / EALL 286a / EAST 261a / HUMS 290a / LITR 285a, The Modern Novel in Brazil and Japan** Seth Jacobowitz

Brazilian and Japanese novels from the late nineteenth century to the present. Representative texts from major authors are read in pairs to explore their commonalities and divergences. Topics include nineteenth-century realism and naturalism, the rise of mass culture and the avant-garde, and existentialism and postmodernism. No knowledge of Portuguese or Japanese required. HU TR

*** PORT 394a / LAST 394a / LITR 294a, World Cities and Narratives** K. David Jackson

Study of world cities and selected narratives that describe, belong to, or represent them. Topics range from the rise of the urban novel in European capitals to the postcolonial fictional worlds of major Portuguese, Brazilian, and Spanish American cities. Conducted in English. WR, HU TR

*** PORT 471a, Directed Reading or Directed Research** K. David Jackson

Individual study for qualified students under the supervision of a faculty member selected by the student. Approval of the director of undergraduate studies is required.

*** PORT 491a, The Senior Essay** K. David Jackson

A research project designed under a faculty director, resulting in a substantial paper written in Portuguese, submitted to the DUS and a second designated reader.

Psychology

Director of undergraduate studies: Jutta Joormann (jutta.joormann@yale.edu), 205 K, 432-0699; psychology.yale.edu

Psychology is the scientific study of the mind, the brain, and human behavior. The Psychology department offers course work and research opportunities in the fields of clinical, cognitive, developmental, neuroscientific, and social psychology. By studying psychology, students better understand human behavior, including who we are, how we do the things we do, and how we enhance our lives and society. The Psychology major provides a foundation for careers in education and research; law; medicine and public health; politics and public policy; and in business fields such as marketing, finance, and management.

COURSE NUMBERING

Courses in the department are organized so that they are best taken in several parallel sequences. Courses numbered from 120–190 and ending in a zero are core survey courses that introduce students to major areas of psychology and provide additional background for more advanced courses. These courses represent major content areas of psychology; students should sample broadly from them before specializing. Courses numbered from 200–209 focus on statistics. Courses numbered from 210–299 teach general methodology or data collection in various areas of psychology. Courses numbered from 300–399 are more advanced courses in a particular specialization. Senior seminars, whose enrollment is limited to twenty students, are numbered from 400–489. These seminars are best taken once a student has appropriate background. Courses numbered from 490 to 499 are special tutorial courses that require permission of the adviser and the director of undergraduate studies (DUS).

PREREQUISITE

PSYC 110, a general survey course, is prerequisite to several 100-level and all 200-level and above courses. This prerequisite may alternatively be satisfied by a score of 5 on the Psychology Advanced Placement test or a score of 7 on the IB Psychology exam.

REQUIREMENTS OF THE MAJOR

The standard major in Psychology for both the B.A. degree program and the B.S. degree program requires twelve term courses beyond PSYC 110, including the senior requirement.

1. Because psychology is so diverse a subject, every student is required to take four courses from the list below. Two of these courses must be from the social science point of view in psychology and two must be from the natural science point of view. At least one from each group must be a course designated as "Core" in the course listings. Students are expected to take their two core courses as early as possible in the major, normally within two terms after declaring their major.

Social science: PSYC 125, 126, 127, 128, 131, 136, 139, 140, 141, 150, 151, 157, 165, 180, 181, 182, 232L, 250, 280L, 308, 313, 315, 330, 332, 334, 342, 355

Natural science: PSYC 120, 130, 135, 147, 149, 160, 161, 162, 171, 179, 230L, 233, 248, 260, 270, 303, 307, 316, 317, 318, 320, 321, 322, 324, 327, 331, 335, PSYC 337, 350, 352, 371, 372, 376

2. Because statistical techniques and the mode of reasoning they employ are fundamental in psychology, a course in statistics (PSYC 200) is required, preferably prior to the senior year. A student may substitute S&DS 103 for PSYC 200 or may substitute an examination arranged with the instructor of PSYC 200 for the course requirement. Students may take the examination only one time, and an additional course in psychology should be taken if the examination substitutes for PSYC 200. A student who has taken S&DS 103 may not take PSYC 200 for credit.
3. To assure some direct experience in collecting and analyzing data, students must elect at least one course, preferably prior to the senior year, in which research is planned and carried out. Courses numbered between 210–299 fulfill this research methods requirement.
4. Students may, with permission of the DUS, count up to three term courses in other related departments toward the major. Appropriate courses are rare and students should consult with the DUS in Psychology about selecting outside courses.

Students interested in research are encouraged to take an independent study course (PSYC 493) as early as the sophomore year. Students may also take PSYC 495 for one-half course credit of independent research per term with prior permission of the faculty adviser and the DUS. To obtain permission, download the tutorial form from the department website, and submit it by the seventh calendar day after classes begin. These independent study courses are graded P/F. No more than a total of three credits from PSYC 490–499 combined may count toward the major.

Neuroscience track Students with a major interest in neuroscience may wish to elect the neuroscience track. Such students are considered Psychology majors for whom the requirements have been modified to accommodate their interests, and to reflect the multidisciplinary nature of modern neuroscience and psychology. Given the broad nature of the field of neuroscience, students may wish to concentrate their studies in one area of the field (e.g., behavioral, cellular and molecular, cognitive, affective, social, clinical, or developmental). Interested students are encouraged to meet with the track adviser, B. J. Casey (bj.casey@yale.edu), 414D SSS, 432-7790. Majors in the neuroscience track meet with the track adviser at the beginning of each term in their junior and senior years.

Requirements for the neuroscience track are the same as for the standard major, with the following additional requirements:

1. Two terms of introductory biology are required for the major, either MCDB 120 or BIOL 101 and 102, and either E&EB 122 or BIOL 103 and 104. Students who have scored 5 on the Advanced Placement test in Biology or scored 7 on the IB Biology exam may place out of these courses.
2. Students must take PSYC 160 or 170 and a data-collection course chosen from PSYC 230L, 260, or 270. MCDB 320 may substitute for the PSYC 160 or 170 requirement, or MCDB 320 and 321L may substitute for the PSYC 230L, 260, or 270 requirement, but not both. If MCDB 320 is substituted for a Psychology

course, it cannot be counted as one of the two advanced science courses outside the department (see item 4 below).

3. As required for the standard major, students in the neuroscience track must take two courses from the social science list above, at least one of which must be designated as "Core" in the course listings. Students in the neuroscience track must also take a course from the natural science list in addition to the courses specified in item 2 above.
4. At least two advanced science courses must be chosen from Molecular, Cellular, and Developmental Biology and Ecology and Evolutionary Biology courses numbered 200 and above that deal with human and/or animal biology; recommended courses include MCDB 200, 202, 205, 210, 250, 300, 315, 320, E&EB 220, 225, and 240. Certain courses outside of these departments may also meet the advanced science requirement, including BENG 350, 421, CPSC 475, MB&B 300, 301, 420, 435, 443, 452, MATH 222, 225, 230, 231, and 241. Other courses may qualify for this requirement with permission of the neuroscience track adviser. Laboratory courses do not count toward the advanced science requirement. Students should note that many advanced science courses have prerequisites that must be taken first.

Credit/D/Fail No more than two term courses taken Credit/D/Fail may be applied toward the major; no 200-level course taken Credit/D/Fail may be applied toward the major.

SENIOR REQUIREMENT

Standard major Majors are required to earn two course credits from courses numbered PSYC 400–499. At least one of these courses (excluding PSYC 490–495, which can only be taken P/F) must be taken during the senior year, for which a student must write a substantial final paper (a minimum of 5,000 words) and receive a letter grade. The B.A. degree is typically awarded to students who conduct a nonempirical literature review during senior year. There are no restrictions in the research format for the B.A. The B.S. degree is awarded to students who conduct empirical research through PSYC 499 during senior year. An empirical research project normally includes designing an experiment and collecting and analyzing the data.

Neuroscience track The senior requirement for the neuroscience track is the same as for the standard major, except that the two required course credits from PSYC 400–499 must have neuroscience content. Students pursuing the B.S. degree in the track must carry out a neuroscientific empirical project in PSYC 499 and must be supervised by a faculty member within the neuroscience area of the Psychology department. Students who wish to work with an affiliated faculty member studying neuroscience outside the department must obtain permission from the neuroscience track adviser.

Distinction in the Major To be considered for Distinction in the Major, students must submit a senior essay to the Psychology department at least one week before the last day of classes in the term when the course used for the senior essay is taken. Senior essays that are submitted after the deadline will be subject to grade penalties. Senior essays considered for Distinction in the Major are graded by a second reader and the essay adviser.

ADVISING

Schedules for all majors must be discussed with, and approved by, the DUS or the adviser for the neuroscience track in Psychology. Only then may a schedule be submitted to the residential college dean's office. For questions concerning credits for courses taken at other institutions or at Yale but outside the Department of Psychology, students should consult with the DUS. For questions concerning the neuroscience track, students should consult with the adviser for the neuroscience track in Psychology.

Computer Science and Psychology major The interdepartmental major in Computer Science and Psychology may be considered by students with interests lying squarely between the two disciplines. See Computer Science and Psychology for more information.

REQUIREMENTS OF THE MAJOR**STANDARD MAJOR**

Prerequisite PSYC 110

Number of courses 12 courses beyond prereq (incl senior req)

Specific course required PSYC 200

Distribution of courses *B.A.* or *B.S.* – 2 social science courses and 2 natural science courses, as specified; 1 course numbered PSYC 210–299

Substitution permitted For PSYC 200, S&DS 103 or exam arranged with instructor; up to 3 relevant courses in other depts, with DUS permission

Senior requirement *B.A.* – 1 course credit from PSYC 400–489 or 499 taken during senior year; 1 additional course credit from PSYC 400–499; *B.S.* – PSYC 499 taken during senior year; 1 additional course credit from PSYC 400–499

NEUROSCIENCE TRACK

Prerequisite PSYC 110

Number of courses 12 courses beyond prereq (incl senior req); same as for the standard major with the additional requirements listed below

Specific courses required MCDB 120 or BIOL 101 and 102; E&EB 122 or BIOL 103 and 104; PSYC 160 or 170; PSYC 200; PSYC 230L, 260, or 270

Distribution of courses *B.A.* or *B.S.* – 2 social science courses and 1 natural science course, as specified; at least 2 advanced science courses, as specified

Substitution permitted MCDB 320 for PSYC 160 or 170; or MCDB 320 and 321L for PSYC 230L, 260, or 270; S&DS 103 or exam arranged with instructor for PSYC 200

Senior requirement *B.A.* – 1 course credit from PSYC 400–489 or 499 with neuroscience content taken during senior year; 1 additional course credit from PSYC 400–499 with neuroscience content; *B.S.* – PSYC 499 taken during senior year, with neuroscience content in a research project; 1 additional course credit from PSYC 400–499 with neuroscience content

FACULTY OF THE DEPARTMENT OF PSYCHOLOGY

Professors Woo-kyoung Ahn, John Bargh, Paul Bloom, Thomas Brown, Tyrone Cannon, B. J. Casey, Marvin Chun, Margaret Clark, John Dovidio, Jutta Joormann, Frank Keil, Joshua Knobe, Marianne LaFrance, Gregory McCarthy, Jennifer Richeson, Peter Salovey, Laurie Santos, Brian Scholl, Nick Turk-Browne

Assistant Professors Arielle Baskin-Sommers, Steve Wohn Chang, Molly Crockett, Yarrow Dunham, Dylan Gee, Maria Gendron, Avram Holmes, Julian Jara-Ettinger

Lecturers Jennifer Hirsch, Kristi Lockhart, Mary O'Brien, Matthias Siemer

Courses

PSYC 110a or b, Introduction to Psychology Staff

A survey of major psychological approaches to the biological, cognitive, and social bases of behavior. SO

PSYC 116b / CGSC 216b / LING 116b, Cognitive Science of Language Robert Frank

The study of language from the perspective of cognitive science. Exploration of mental structures that underlie the human ability to learn and process language, drawing on studies of normal and atypical language development and processing, brain imaging, neuropsychology, and computational modeling. Innate linguistic structure vs. determination by experience and culture; the relation between linguistic and nonlinguistic cognition in the domains of decision making, social cognition, and musical cognition; the degree to which language shapes perceptions of color, number, space, and gender. SO

* **PSYC 125a / CHLD 125a / EDST 125a, Child Development** Nancy Close and Carla Horwitz

The reading of selected material with supervised participant-observer experience in infant programs, a day-care and kindergarten center, or a family day-care program. Regularly scheduled seminar discussions emphasize both theory and practice. An assumption of the course is that it is not possible to understand children – their behavior and development – without understanding their parents and the relationship between child and parents. The focus is on infancy as well as early childhood. Enrollment limited to juniors and seniors. WR, SO

PSYC 126b, Attraction and Relationships Jennifer Hirsch

Theory and empirical research on the antecedents and consequences of attraction, and on intra- and interpersonal processes that either facilitate or interfere with the formation and maintenance of close relationships. Methodological bases for rigorous study of these topics. SO

* **PSYC 127a or b / CHLD 127a or b / EDST 127a or b, Theory and Practice of Early Childhood Education** Carla Horwitz

Development of curricula and responsive educational environments for young children – in light of current research and child development theory. The course focuses on critical analysis of programs for young children and the ways in which political context contributes to the practice of education. Regularly scheduled seminar discussions emphasize both theory and practice. Supervised participant-observer experience in an early childhood classroom. Components of the course include behavior and development, planning, assessment and standards, culture, teacher preparation, and working with families. Priority given to seniors, juniors and Ed Studies students. WR, SO RP

* **PSYC 128b / CHLD 128b / EDST 128b, Language, Literacy, and Play** Nancy Close
and Carla Horwitz

The complicated role of play in the development of language and literacy skills among preschool-aged children. Topics include social-emotional, cross-cultural, cognitive, and communicative aspects of play. WR, SO RP

PSYC 130a / CGSC 110a, Introduction to Cognitive Science Natalia Córdova Sánchez
An introduction to the interdisciplinary study of how the mind works. Discussion of tools, theories, and assumptions from psychology, computer science, neuroscience, linguistics, and philosophy. SO

[**PSYC 140, Developmental Psychology**]

PSYC 150b / EDST 160b, Social Psychology Maria Gendron
Theories, methodology, and applications of social psychology. Core topics include the self, social cognition/social perception, attitudes and persuasion, group processes, conformity, human conflict and aggression, prejudice, prosocial behavior, and emotion. SO

[**PSYC 157, Psychology and the Good Life**]

PSYC 160a / NSCI 160a, The Human Brain Gregory McCarthy
Introduction to the neural bases of human psychological function, including social, cognitive, and affective processing. Preparation for more advanced courses in cognitive and social neuroscience. Topics include memory, reward processing, neuroeconomics, individual differences, emotion, social inferences, and clinical disorders. Neuroanatomy, neurophysiology, and neuropharmacology are also introduced. SC

PSYC 161b / NSCI 161b, Drugs, Brain, and Behavior Hedy Kober
An introduction to psychoactive drugs and their effects on both brain and behavior. Review of pharmacological and brain mechanisms of different classes of legal, illegal, and medicinal drugs, including alcohol, caffeine, tobacco, stimulants, depressants, antidepressants, and hallucinogens. Individual drugs' pharmacokinetics, mechanisms of action, dosing, routes of administration, and patterns and effects of use and misuse. Some attention to substance use disorders/addictions, prevention, and treatment. SC

PSYC 179a, Thinking Woo-kyoung Ahn
A survey of psychological studies on thinking and reasoning, with discussion of ways to improve thinking skills. Topics include judgments and decision making, causal learning, logical reasoning, problem solving, creativity, intelligence, moral reasoning, and language and thought. SO

PSYC 180b / EDST 180b, Abnormal Psychology Jutta Joermann
The major forms of psychopathology that appear in childhood and adult life. Topics include the symptomatology of mental disorders; their etiology from psychological, biological, and sociocultural perspectives; and issues pertaining to diagnosis and treatment. SO

PSYC 200b, Statistics Staff
Measures of central tendency, variability, association, and the application of probability concepts in determining the significance of research findings. QR

* **PSYC 229Lb / NSCI 229Lb, Laboratory in Human Neuroscience** Gregory McCarthy
Instruction in the acquisition and analysis of human neuroscience data. This laboratory complements the lecture course "Methods in Human Neuroscience" (PSYC 230/NSCI

240). The main topics include structural, diffusion, and functional magnetic resonance imaging (MRI), electroencephalography (EEG), and event-related potentials. Students engage in laboratory exercise that illustrate the design and analysis of experiments using each technique. These laboratory exercises involve acquiring, visualizing, and analyzing MRI and EEG data. Prerequisites: PSYC 160/NSCI 160, PSYC 200, PSYC 230/NSCI 240, or permission of the instructor. SC RP ½ Course cr

PSYC 235a or b, Research Methods, Writing Intensive Staff

Introduction to general principles and strategies of psychological research. Topics include generating and testing hypotheses, laboratory and field experiments, scale construction, sampling, archival methods, case studies, ethics and politics of research, and Internet and cross-cultural methods. Hands-on research experience in laboratories. WR, SO

PSYC 250b, Research Methods in Clinical Psychology Arielle Baskin-Sommers

Introduction to the underpinnings, processes, and methods of scientific research utilized in clinical psychology. Rationale for various methods, generating and testing hypotheses, nonhuman animal models, laboratory and applied studies, assessment methods, ethical issues, protection of participants, and research findings in relation to public life and policy. WR, SO

[PSYC 258, Computational Methods in Human Neuroscience]

[PSYC 303, Social Neuroscience]

[PSYC 308, Intergroup Relations: The Psychology of Social Inequality]

* **PSYC 313b / CGSC 313b / PHIL 305b, Philosophy for Psychologists** Joshua Knobe

Introduction to frameworks developed within philosophy that have applications in psychological research. Principal topics include the self, causation, free will, and morality. Recommended preparation: a course in philosophy or psychology. HU, SO

PSYC 315b, The Modern Unconscious John Bargh

The notion of the unconscious mind traced from the early 1800s through Freud to present-day cognitive science, with a focus on the past thirty years. The power and function of the unconscious as a pervasive part of normal everyday human functioning. Readings mainly from cognitive and social cognitive psychology but also philosophy of mind and evolutionary biology. SO

PSYC 317a / EDST 237a / LING 217a, Language and Mind Maria Piñango

The structure of linguistic knowledge and how it is used during communication. The principles that guide the acquisition of this system by children learning their first language, by children learning language in unusual circumstances (heritage speakers, sign languages) and adults learning a second language, bilingual speakers. The processing of language in real-time. Psychological traits that impact language learning and language use. SO RP

PSYC 321b / NSCI 346b, Psychopharmacology Thomas Brown

Study of therapeutic and recreational drugs that affect the central nervous system and influence mood, cognition, perception, and behavior. Drugs considered vary from psychotropic to hypnotic to narcotic. Prerequisite: PSYC 160 or 170 or equivalent, or permission of instructor. SC

PSYC 326a, Psychotherapy Mary O'Brien

Psychotherapy is designed to introduce students to a broad range of evidence-based techniques for enhancing psychological functioning. We discuss theoretical and empirical readings, treatment manuals, videos of experts demonstrating therapeutic techniques, and relevant TED talks. Additionally, we engage in experiential learning and practice applying techniques in our daily lives. This course begins with a discussion of the importance of scientific evaluation of psychotherapy. Next, we explore multicultural competence in psychotherapy and consider ways to tailor each therapeutic approach to optimize the relevance and effectiveness for diverse populations. Techniques for establishing a therapeutic alliance are discussed and practiced, followed by exploration of therapeutic approaches from Cognitive Behavioral Therapy (CBT), Acceptance and Commitment Therapy (ACT), Self-Compassion and Growth Mindset research, Dialectical Behavior Therapy (DBT), Psycho-educational Family Therapy, and Couples and Group Therapy. Prerequisite: PSYC 180. SO

*** PSYC 328b / EDST 328b, Learning in the School-Age Child: Core Mechanisms**

Kristi Lockhart

This course focuses on empirically supported principles of learning that are used with K to 8th grade children (and also adolescents and adults) to enhance learning outcomes. We look at twenty-six (A to Z) core mechanisms used to promote learning. Each mechanism is explored from a theoretical, research-based, and practical perspective. Studies conducted in cognitive and perceptual psychology, social psychology, behavioral psychology as well as cultural psychology have contributed to the knowledge of these mechanisms. We discuss how the mechanisms work, what problems they overcome, and the positive (as well as negative) ways in which they can be implemented. Prerequisite: PSYC 110 or credit for AP Psychology. SO

PSYC 329b / LING 146b, Language, Sex, and Gender Natalie Weber and Claire Bowers

Sex-based asymmetries in language structure and language use. Role of language in encoding, reflecting, or reinforcing social attitudes and behavior. The "he/man" lexicon: sex-marking, reform, and resistance. Gender and sexual diversity as linguistic variables. Genderlects: differences (real and perceived) between male and female speech, conversational styles, and linguistic communities. SO RP

PSYC 330a, Psychology and the Law Kristi Lockhart

Contributions of psychological theory and research to our understanding of the law and the criminal justice system. Topics include criminality, eyewitness testimony, lie detection, jury decision making, the death penalty, the insanity defense, civil commitment, prisons, repressed memories, children as witnesses and defendants, and the role of psychologists as expert witnesses and trial consultants. SO

*** PSYC 334a / CHLD 334a, Developmental Psychopathology** Fred Volkmar, Eli Lebowitz, and Denis Sukhodolsky

Study of developmental psychopathology during childhood and adolescence, team taught by a child psychiatrist and three psychologists. Topics include: aspects of normal development, assessment methods, clinical disorders, treatment, and legal and social policy issues. Review of normative development, followed by discussion of theoretical approaches to understanding developmental aspects of common mental health conditions in childhood. Attention to treatment models as well as relevant issues

of culture and ethnicity in the expression of psychopathology. Prerequisites: PSYC 130, 140, 180, or equivalent, or with permission of instructor.

PSYC 335b / NSCI 340b, Cognitive Neuroscience Steve Wohn Chang

This course covers how cognition is made by the brain. Students learn brain mechanisms underlying human cognition, including making decisions, paying attention, regulating emotion, remembering events, as well as understanding others. The course discusses both established and newly emerging findings based on several landmark experiments in both humans and animals. During this process, students are also introduced to cutting-edge techniques in cognitive neuroscience for studying human cognition. Prerequisite: PSYC 160 or specific chapter readings from the instructor. SC

*** PSYC 350b / CHLD 350b / EDST 350b, Autism and Related Disorders** Fred Volkmar and James McPartland

Weekly seminar focusing on autism and related disorders of socialization. A series of lectures on topics in etiology, diagnosis and assessment, treatment and advocacy, and social neuroscience methods; topics cover infancy through adulthood. Supervised experience in the form of placement in a school, residence, or treatment setting for individuals with autism spectrum disorders. Details about admission to the course are explained at the first course meeting. Prerequisite: an introductory psychology course. SO

PSYC 352a / CGSC 352a / NSCI 352a, Arrested or Adaptive Development in the Adolescent Brain BJ Casey

Study of empirical and theoretical accounts of adolescent-specific changes in the brain and in behavior that relate to the development of self control. Discussions will focus on adaptive and arrested adolescent brain development in the context of relevant legal, social, and health policy issues. SC

[PSYC 355, Clinical Psychology in the Community]

*** PSYC 372a / LING 490a, Research Methods in Linguistics** Raffaella Zanuttini
Development of skills in linguistics research, writing, and presentation. Choosing a research area, identifying good research questions, developing hypotheses, and presenting ideas clearly and effectively, both orally and in writing; methodological issues; the balance between building on existing literature and making a novel contribution. Prepares for the writing of the senior essay.

PSYC 376a / NSCI 341a, Learning and Memory Thomas Brown

The basic facts, general principles, and theories that describe how higher animals, from mice to humans, are changed by their experiences. The historically separate fields of learning and memory research desegregated under a neuroscientific perspective that recognizes the evolutionary continuity among higher animals. Prerequisite: Introductory courses in biology and psychology, or permission of instructor. SC, SO

[PSYC 405, Social Emotions]

*** PSYC 409a, Science of Free Will** Thomas Brown

The scientific facts and arguments behind the theory that free will is an illusion or invalid construct. Implications of this theory for religion, law, and morality. Supporting evidence drawn from the fields of psychology, neuroscience, genetics, physics, and complex adaptive systems. SO

[PSYC 411, Systems Neuroscience]

*** PSYC 416a, The Psychology of Group Life** Yarrow Dunham

Study of social categorization, the psychological tendency to partition individuals into groups, with attention to cognitive, developmental, social, and evolutionary approaches. The nature and development of social categorization, including its evolutionary advantages and its relation to the phenomenon of categorization more broadly. Ways in which social categorization influences prejudice and discriminatory behavior; methods for reducing such negative effects. Prerequisites: PSYC 110 and permission of the instructor. SO

*** PSYC 417a, Etiology and Treatment of Addictions** Arielle Baskin-Sommers

Research from the fields of cognitive neuroscience, psychology, sociology, and public health on the etiology and treatment of addictions. Social, neurobiological, and genetic explanations for addiction; evaluation of addiction treatments; the social construction of substance policies. SO

*** PSYC 419b / CGSC 419b / NSCI 419b, Topics in Brain Development, Law, and Policy** BJ Casey

Healthy development is a fundamental right of the individual, regardless of race, ethnicity, socioeconomic status, or gender. Youth require special protections of their rights due to vulnerabilities related to their physical and mental immaturity. These rights include, not only protections, but opportunities for building the cognitive, emotional, and social skills necessary for becoming a healthy adult and a contributing member of society. This seminar examines the extent to which legal policies and practices in the treatment of youths are consistent with scientific knowledge on psychological and brain development. Each class discusses one or more legal cases highlighted in the context of brain and psychological science and current laws and policies. Prerequisite: PSYC 110 and PSYC 160 preferred. SO

*** PSYC 420b / CGSC 420b / NSCI 440b, Topics in Clinical Neuroscience** Avram Holmes

An overview and examination of the neuroscience of psychiatric illness. We focus on cutting-edge research in humans and animals aimed at understanding the biological mechanisms that underlie psychiatric illness. Although these questions date back to early philosophical texts, only recently have experimental psychologists and neuroscientists begun to explore this vast and exciting domain of study. We discuss the evolutionary and developmental origins of individual differences in human personality, measurement issues, fundamental dimensions of psychopathology, stability/plasticity, heritability, and implications therapeutic interventions as well as the associated broader implications for public policy. A major focus is on the neurobiology of fear and anxiety, including brain circuits, molecular genetic pathways, and epigenetics. A secondary focus is on differences in behavior and biology that confer risk for the development of depression and addiction, including the biological systems involved in hedonic pleasure, motivated goal pursuit, and the regulation of impulses in the face of everyday temptation. Students should have some background in psychology; PSYC 110 and PSYC 160 preferred. SO

*** PSYC 422a / CGSC 426a / EP&E 490a / PHIL 426a, The Cognitive Science of Morality** Joshua Knobe

Introduction to the emerging field of moral cognition. Focus on questions about the philosophical significance of psychological findings. Topics include the role of emotion in moral judgment; the significance of character traits in virtue ethics and personality psychology; the reliability of intuitions and the psychological processes that underlie them. HU

[**PSYC 425, Social Perception**]

[**PSYC 428, Neuroscience of Decision-Making**]

*** PSYC 429b, Psychology of Prejudice, Stereotyping, and Discrimination** Jennifer Richeson

Examination of the social psychology of stereotyping, prejudice, and discrimination. Specifically, the processes of mind and brain that give rise to both positive and negative relations between members of different societal groups. PSYC 110, PSYC 200 (or equivalent), PSYC 235 (or equivalent), PSYC 150 (recommended)

*** PSYC 430a, Topics in Cultural Psychology** Maria Gendron

Overview of theory and research in cultural psychology, including the role of culture in social, cognitive, and health domains. Principles of the acquisition, transmission, and evolution of culture. Specialized topics include culture in non-human animals, and the intersection between culture and globalization and technology. Prerequisite: PSYC 110. SO

[**PSYC 437, Minds, Brains, and Machines**]

*** PSYC 477b / EDST 377b, Psychopathology and the Family** Kristi Lockhart

The influence of the family on development and maintenance of both normal and abnormal behavior. Special emphasis on the role of early childhood experiences. Psychological, biological, and sociocultural factors within the family that contribute to variations in behavior. Relations between family and disorders such as schizophrenia, depression, anorexia nervosa, and criminality. Family therapy approaches and techniques. SO

*** PSYC 493a or b, Directed Research** Jutta Joormann

Empirical research projects or literature review. A student must be sponsored by a faculty member, who sets the requirements and supervises the student's progress. To register, the student must download a tutorial form from <http://psychology.yale.edu/undergraduate/undergraduate-major-forms>, complete it with the adviser, and submit it to the director of undergraduate studies by the seventh calendar day from the beginning of the term. The normal minimum requirement is a written report of the completed research or literature review, but individual faculty members may set alternative equivalent requirements. May be elected for one or two terms. May not be used for the Psychology senior requirement.

*** PSYC 495a or b, Research Topics** Jutta Joormann

Empirical research project or literature review. A student must be sponsored by a faculty member, who sets the requirements and supervises the student's progress. To register, the student must download a tutorial form from <http://psychology.yale.edu/undergraduate/undergraduate-major-forms>, complete it with the adviser, and submit it to the director of undergraduate studies by the seventh calendar day from the

beginning of the term. The normal minimum requirement is a written report of the completed research or literature review, but individual faculty members may set alternative equivalent requirements. May be elected for one or two terms. May be repeated for credit. May not be used for the Psychology senior requirement.

½ Course cr

*** PSYC 499a or b, Senior Essay** Jutta Joormann

Independent senior research project (either empirical research or literature review), conducted under the guidance of a faculty adviser who sets the requirements and supervises the research. To register, the student must download a tutorial form from <http://psychology.yale.edu/undergraduate/undergraduate-major-forms>, complete it with the adviser, and submit it to the director of undergraduate studies by the seventh calendar day from the beginning of the term. The normal minimum requirement is a written report of the completed research or literature review, but individual faculty members may set alternative equivalent requirements. A paper of 5,000 words or more meets the writing needed for the senior requirement. To be considered for Distinction in the Major, the paper should be submitted at least one week before the last day of classes and will be graded by the adviser and a second reader assigned by the DUS.

Public Health

For information about Yale College course offerings related to health, see under Global Health Studies.

The five-year B.A.–B.S./M.P.H. degree program The B.A.–B.S./M.P.H. degree program in Public Health offers Yale College students interested in the field of public health the opportunity to earn a bachelor's degree from Yale College and an M.P.H. degree from the Yale School of Public Health (YSPH) in a five-year joint program.

Undergraduate requirements During four years of Yale College enrollment, students complete any standard major. Four of the thirty-six course credits required for the bachelor's degree are typically taken at YSPH in partial fulfillment of the M.P.H. degree requirements. Students may take additional YSPH courses while enrolled in Yale College, but no more than four course credits earned in the professional schools may be applied toward the bachelor's degree. Two Yale College courses selected from an approved list may be counted as electives toward the M.P.H. degree requirements.

Students accepted into the B.A.–B.S./M.P.H. program typically take the following courses at the School of Public Health while enrolled in Yale College: BIS 505, Introduction to Statistical Thinking I and II; CDE 505, Social and Behavioral Foundations of Health; CDE 508, Principles of Epidemiology I; EPH 515, Introduction to Research and Professional Ethics Seminar; either HPM 510, Introduction to Health Policy and Health Systems, or HPM 560, Health Economics and U.S. Health Policy; and either EHS 510, Introduction to Environmental Health, or EHS 503, Introduction to Toxicology.

During the summer between the fourth and fifth years, students complete a public health internship.

Master's program requirements Students accepted into the program affiliate with one of seven departments or programs at the School of Public Health; this affiliation determines the primary adviser and the specific requirements for the five-year program. During the fifth year, students are in full-time residence at the School of Public Health to complete their remaining course work and master's thesis.

Admission requirements Students apply to the B.A.–B.S./M.P.H. program in the fall term of the junior year. Successful candidates present a verified commitment to improving the health of the public and evidence of quantitative skills. Two terms each of college-level mathematics, science, and social science courses are recommended, although some of these courses can be completed after applying to the program. Additional qualifications may be required by particular departments or programs. Applications are submitted through the School of Public Health's application service, SOPHAS Express, and include transcripts, SAT scores, two letters of recommendation (at least one from an instructor of a Yale course), a personal statement, and approval from the student's residential college dean. Questions about admissions should be directed to Mary Keefe (mary.keefe@yale.edu).

Further information about the program may be viewed on the YSPH website.

Religious Studies

Director of undergraduate studies: Eliyahu Stern, (elياهو.stern@yale.edu) 451 College St., 432-0841; religiousstudies.yale.edu

The Religious Studies curriculum approaches the history of human thought and practice while focusing on specific geographical, cultural, and philosophical areas of scholarly interest. Courses explore when, how, and why communities forge systems of value. Faculty guide students to examine institutions, practices, texts, and ideas simultaneously: to see how texts influence institutions, how institutions prescribe habits, and how human beings resist and reevaluate the given institutions and practices of their specific geographic and historical contexts. The Religious Studies department is particularly known for its promotion of scholarly research by undergraduates. Undergraduate majors acquire the linguistic, philosophical, and historical acumen necessary for an in-depth research project during their senior year.

COURSE NUMBERING

Religious Studies course offerings, other than first-year seminars, are arranged in four categories. Group A features general and comparative courses that engage more than one tradition, concept, or text. Group B includes survey courses that provide a broad introduction to a particular religious tradition or scripture in historical context. Group C includes courses on specialized topics in religious studies, both introductory and intermediate. Group D offers advanced courses on specialized topics which typically have specific prerequisites or require the permission of the instructor. Students who want a broad introduction to the study of religions can choose courses listed under Groups A or B, though courses listed under Group C are also open without prerequisite. Religious Studies majors develop specialized concentrations as they plan a major program in consultation with the director of undergraduate studies (DUS) and other members of the faculty.

REQUIREMENTS OF THE MAJOR

The department offers two programs for students majoring in Religious Studies: the standard major and a major in which religious studies is combined with another subject closely related to the senior essay. Both programs require a core of six courses, a seminar, and a two-term senior essay.

Core requirement A core of six courses in Religious Studies is required of all majors and should be selected in consultation with the DUS. Students select one core course from Group A that involves the comparative study of religions and three core courses from Groups B and C that concentrate on the historical or textual study of three different religious traditions or regions. Students are encouraged to select religions and regions as widely divergent as possible in order to balance in-depth study with global diversity and connection. One core course must focus on systematic thought (ethics, philosophy, or theology). The final core course is RLST 490, Religion and Society, the junior seminar on the academic study of religion; this course is required for all majors.

Seminar requirement Before the end of the junior year, students must complete a seminar (in addition to the junior seminar) that requires a major research paper. In Program I, this seminar must be an elective in Religious Studies. In Program II, it

may be a course in Religious Studies, or it may constitute one of the four term courses outside the department.

Program I. The standard major Program I consists of twelve term courses in Religious Studies, including the core of six required courses, the two-term senior essay, and four electives. The electives are usually selected from Groups C and D and form a coherent unit to help the student prepare for the senior essay. Certain cognate courses in other departments that are integral to the student's area of concentration may count toward the major with permission of the DUS. Normally the maximum number of cognate courses that may be applied is two. Two terms of an ancient language related to the study of religion may, with permission of the DUS, be counted.

Program II. Religious studies with another subject Program II consists of eight term courses in Religious Studies (the core of six required courses and the two-term senior essay) and four term courses outside the department, one of which may fulfill the seminar requirement outlined above. The four courses outside the department need not directly concern religion, but they must form a coherent, focused unit of concentration. Through them students can develop expertise in a methodological approach, cultural area, historical period, or body of literature contributing to the senior essay. Examples of successful combinations might be: four courses in Chinese history, language, and literature with a senior essay topic on Chinese Buddhism; four courses in early American history and literature with a topic on colonial American religion; four courses in a specific area of biology and medical science with a topic on biomedical ethics; or four courses in globalization and international relations with a topic on religion and globalization. Each student's petition to take this program will be judged on its contribution to the student's senior essay. Normally, introductory courses in other departments may not count among the outside courses; appropriate language courses at a higher level may. Students electing Program II must, at the end of the junior year and in no case later than the beginning of the senior year, obtain approval for their proposed program from the DUS. Students who think they may elect this program should consult the DUS as early as possible in their studies to begin suitable selection of courses.

SENIOR REQUIREMENT

Students in both programs must write a senior essay under the supervision of a faculty adviser in the student's area of concentration. In selecting a senior essay topic, students normally choose a subject on which they have completed course work before commencing the senior year. The essay counts as two term courses toward the major and is taken in both terms of the senior year. The student should begin choosing a senior essay topic during the second term of the junior year, and early in the first term of the senior year must submit a Statement of Intention approved by a faculty adviser and the DUS. The senior essay course, RLST 491 and 492, includes research and writing assignments as well as colloquia in which seniors present and discuss their research. The student must submit at least ten pages of the essay to the DUS by the last day of classes in the first term in order to receive a grade of "satisfactory" for that term.

ADVISING

Students majoring in Religious Studies who plan to do graduate work in the subject are strongly encouraged to study the languages that they will need for their graduate programs.

Courses in the Divinity School Some Divinity School courses may count toward the major, with permission of the DUS. Divinity School faculty are eligible to advise senior essays. Information about courses and faculty may be found in the Divinity School online bulletin.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 12 term courses (incl senior req)

Specific course required RLST 490 (one of the core courses)

Distribution of courses *Both programs*—5 remaining core courses to include: 1 course in comparative religions; 3 courses in historical or textual study of religious traditions, as specified; 1 course in systematic thought, as specified; *Program I*—4 electives, one of which is seminar as specified; *Program II*—4 non-introductory courses in another subject linked with senior essay, one of which is seminar, approved by DUS

Substitution permitted *Both programs*—Divinity School courses, with DUS permission; *Program I*—2 related courses in other depts, with DUS permission

Senior requirement Senior essay (RLST 491, 492)

FACULTY OF THE DEPARTMENT OF RELIGIOUS STUDIES

Professors Gerhard Böwering, Stephen Davis, Carlos Eire, Steven Fraade, Paul Franks, Bruce Gordon, Philip Gorski, Phyllis Granoff, Frank Griffel, John Hare, Christine Hayes, Noel Lenski, Nancy Levene, Kathryn Lofton (*Chair*), Ivan Marcus, Laura Nasrallah, Sally Promey, Harry Stout, Shawkat Toorawa, Robert Wilson

Associate Professors Zareena Grewal, Noreen Khawaja, Hwansoo Kim, Eliyahu Stern, Travis Zadeh

Assistant Professors Maria Doerfler, Eric Greene

Senior Lecturers John Grim, Margaret Olin, Mary Evelyn Tucker

Lecturers Jimmy Daccache, Supriya Gandhi, Stephen Latham

First-Year Seminars

* **RLST 007a, What Didn't Make It into the Bible** Maria Doerfler

Over two billion people alive today consider the New Testament to be sacred scripture. But how did the books that made it into the bible get there in the first place? Who decided what was to be part of the bible and what wasn't? How did these decisions affect the structure of nascent Christian communities, their relationship to surrounding Greco-Roman and Jewish society, and the subsequent development of Christian churches? How would the history of the world's largest organized religion look differently if a given book didn't make the final cut and another one did? Hundreds of ancient Christian texts are not included in the New Testament. This course focuses on these excluded writings and uses them to help reconstruct the earliest Christian communities. We explore Gnostic gospels, hear of a five-year-old Jesus throwing

temper tantrums while killing (and later resurrecting) his classmates, peruse ancient Christian romance novels, tour heaven and hell, read the garden of Eden story told from the perspective of the snake, and learn how the world will end. In critically examining these ancient narratives and the communities that wrote them, you will learn about the content and history of the New Testament, better appreciate the diversity of formative Christianity, understand the historical context of the early church, examine the earliest social forms of Christianity, and explore the politics behind what did and did not make it into the bible. WR, HU

* **RLST 015a / SAST 057a, Gods and Heroes in Indian Religions** Phyllis Granoff

The basic doctrines and practices of India's three classical religions, Buddhism, Jainism, and Hinduism, explored through close reading of texts in translation. Lives of the founders, great monks, nuns, and lay followers of Buddhism and Jainism; myths of the major Hindu gods; heroines and goddesses in the three traditions. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

* **RLST 018a / SAST 058a, Yoga in South Asia and Beyond** Supriya Gandhi

The history of yoga practice and thought from the earliest textual discussions of yoga until the present day. Topics include the body, cosmology, cross-cultural interactions, colonialism, and orientalism. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU

General, Comparative, and Thematic Courses (Group A)

RLST 100a / MMES 191a, Introduction to World Religions Gerhard Bowering

Introduction to the literature, ideals, concepts, practices, rituals, and institutions of four major world religions as they have appeared in history: Hinduism, Buddhism, Christianity, and Islam. A historical survey combined with a phenomenological treatment of principal topics. HU

* **RLST 102b / EAST 390b, Atheism and Buddhism** Hwansoo Kim

A critical examination of atheism and religions (Buddhism), with a focus on intellectual, religious, philosophical, and scientific debates about God, the origin of the universe, morality, evolution, neuroscience, happiness, enlightenment, the afterlife, and karma. Readings selected from philosophical, scientific, and religious writings. Authors include some of the following: Charles Darwin, Bertrand Russell, Christopher Hitchens, Richard Dawkins, Deepak Chopra, Sam Harris, Owen Flanagan, Stephen Batchelor, and the Dalai Lama. HU

* **RLST 105b, Animals in Indian Religions** Phyllis Granoff

Examination of divergent beliefs about the place of animals in the hierarchy of living beings. Study of Buddhist, Hindu, and Jain texts dealing with animals, with readings of the Buddha's births as an animal, the Ramayana on the monkey god Hanuman, and Jain rebirth narratives. Philosophical readings on animal sacrifice culminate in a consideration of recent debates against sacrifice in the Indian supreme court. HU

* **RLST 107a / PHIL 192a, Metaphysics and Modernity** Nancy Levene

This course surveys concepts and controversies in and among select works of philosophy, theology, and literature. The focus is twofold: on reading works in view of their own principles, thus on questions of truth and interpretation, and on

histories of the ideas, thus on questions of origin, change, and story. What and when is metaphysics? What and when is modernity? HU

RLST 115a / AMST 116a, How to Build an American Religion Kathryn Lofton

How communities can be organized through code, charisma, ritual, and cosmology.

Topics include strategies for concretizing utopia and establishing communal principles, expanding audiences, and specifying creed. This course serves as an introduction to religion through theoretical readings and specific examples drawn from the transnational American scene, past and present. Discussion of particular leaders, sects, practices, and media will offer insights into how ideas organize societies and individuals establish themselves as icons. Students adapt strategies taught in the course in order to practice their own capacity to foster social movements, develop and critique brands, and consider the relationship between religion, politics, and economy. HU

RLST 118b / PLSC 242b, Biblical and Constitutional Interpretation in Dialogue

Maria Doerfler

How people read important books. Study of the strategies used throughout history to interpret two of the most authoritative texts: the bible and the U.S. Constitution. Different exegetes and exegetical communities continue to disagree on ways to read these books, and on how these readings should shape thought, practice, and national policy. Case studies include discussion of proper relations between civic and religious communities; the issue of slavery; and the topic of same-sex marriage. WR, HU

Surveys of Religious Traditions (Group B)

RLST 155b / HIST 351b / MMES 193b, The Golden Age of Islam Gerhard Bowering

The development of Islamic civilization in the Middle East, North Africa, Spain, Iran, and India from Muhammad through the Mongol invasions to the rise of the Ottoman, Safavid, and Mughal empires (600–1500 C.E.). Emphasis on the intellectual and religious history of Islam in the age of the caliphates and during the rule of regional dynasties. HU

RLST 160a / HIST 280a / ITAL 315a, The Catholic Intellectual Tradition Carlos Eire

Introductory survey of the interaction between Catholicism and Western culture from the first century to the present, with a focus on pivotal moments and crucial developments that defined both traditions. Key beliefs, rites, and customs of the Roman Catholic Church, and the ways in which they have found expression; interaction between Catholics and the institution of the Church; Catholicism in its cultural and sociopolitical matrices. Close reading of primary sources. HU

Topics in Religious Studies (Group C)

* **RLST 121b / EALL 296b / EAST 391b, Religion and Culture in Korea** Hwansoo Kim

Introduction to Shamanism, Buddhism, Confucianism, Daoism, Christianity, and new religions in Korea from ancient times to the present. Examination of religious traditions in close relationships with social, economic, political, and cultural environments in Korean society. Examination of religious tensions, philosophical arguments, and ethical issues that indigenous and foreign religions in Korea have engaged throughout history to maximize their influence in Korean society. HU

*** RLST 166b / PHIL 135b, Classical Arabic Philosophy** Frank Griffel

Close reading of primary texts from the Arabic philosophical tradition c. 750–1300, with attention to the major arguments and underlying assumptions of each author. The translation movement via al-Farabi, Ibn Sina (Avicenna), al-Ghazali, Maimonides, and others; the philosophical textbooks of Muslim madrasa education. HU

RLST 188a / HSAR 143a / SAST 260a, Introduction to the History of Art: Buddhist Art and Architecture, 900 to 1600 Mimi Yiengpruksawan

Buddhist art and architecture of East Asia, Southeast Asia, and Tibet from the tenth century to the early modern period. Emphasis on cross-regional engagements including the impact of Islam. HU

*** RLST 197a, Introduction to Jain Story Literature** Phyllis Granoff

This course allows students to gain familiarity with the wealth of narrative literature preserved by Jains in commentaries to canonical sutras, medieval Treasuries of Stories, and monastic biographies. Where appropriate students also read and discuss corresponding Buddhist narratives. All reading is in the primary languages. One year of Sanskrit required. HU

*** RLST 201a / HIST 232Ja / HUMS 443a / JDST 270a / MMES 342a, Medieval Jews, Christians, and Muslims In Conversation** Ivan Marcus

How members of Jewish, Christian, and Muslim communities thought of and interacted with members of the other two cultures during the Middle Ages. Cultural grids and expectations each imposed on the other; the rhetoric of otherness—humans or devils, purity or impurity, and animal imagery; and models of religious community and power in dealing with the other when confronted with cultural differences. Counts toward either European or Middle Eastern distributional credit within the History major, upon application to the director of undergraduate studies. WR, HU RP

RLST 202b / HIST 345b / JDST 265b / MMES 148b, Jews in Muslim Lands from the Seventh to the Sixteenth Centuries Staff

Jewish culture and society in Muslim lands from the time of the Prophet Muhammad to that of Suleiman the Magnificent. Topics include Islam and Judaism; Jerusalem as a holy site; rabbinic leadership and literature in Baghdad; Jewish courtiers, poets, and philosophers in Muslim Spain; and the Jews in the Ottoman Empire. HU RP

*** RLST 233a / ENGL 346a / HUMS 253a, Poetry and Faith** Christian Wiman

Issues of faith examined through poetry, with a focus on modern Christian poems from 1850 to the present. Some attention to poems from other faith traditions, as well as to secular and antireligious poetry. HU

RLST 245a / ARCG 244a / NELC 109a, The Age of Akhenaton John Darnell

Study of the period of the Egyptian pharaoh Akhenaton (reigned 1353–1336 B.C.E.), often termed the Amarna Revolution, from historical, literary, religious, artistic, and archaeological perspectives. Consideration of the wider Egyptian, ancient Near Eastern, African, and Mediterranean contexts. Examination of the international diplomacy, solar theology, and artistic developments of the period. Reading of primary source material in translation. HU

* **RLST 251a / AFST 128a / ARCG 128a / EGYPT 128a, Magic and Ritual in Ancient Egypt** John Darnell

Introduction to ancient Egyptian magic and rituals with an overview on the use of magic and discussion of the different rituals and festivals attested in Ancient Egypt.
HU

* **RLST 260a / AMST 451a / HIST 174Ja, Religion, War, and the Meaning of America** Harry Stout

The relationship between religion and war in American history from colonial beginnings through Vietnam. The religious meanings of Americans at war; the mutually reinforcing influences of nationalism and religion; war as the norm of American national life; the concept of civil religion; biblical and messianic contexts of key U.S. conflicts. HU

RLST 268b / HIST 281b, Christian Mysticism, 1200–1700 Carlos Eire

An introductory survey of the mystical literature of the Christian West, focusing on the late medieval and early modern periods. Close reading of primary texts, analyzed in their historical context. HU

* **RLST 277a / PHIL 202a, Existentialism** Noreen Khawaja

Introduction to key problems in European existentialism. Existentialism considered not as a unified movement, but as a tradition of interlocking ideas about human freedom woven through the philosophy, religious thought, art, and political theory of late modern Europe. Readings from Kierkegaard, Nietzsche, Heidegger, Gide, Heidegger, Fanon, Sartre, de Beauvoir, Césaire. HU

RLST 290a / MMES 290a / PLSC 435a, Islam Today: Jihad and Fundamentalism Frank Griffel

Introduction to modern Islam, including some historical background. Case studies of important countries in the contemporary Muslim world, such as Egypt, Iran, Pakistan, and Saudi Arabia. Islam as a reactive force to Western colonialism; the ideals of Shari'a and jihad; violence and self-sacrifice; and Islam as a political ideology. HU

* **RLST 303b / PHIL 311b, The End of Metaphysics** Nancy Levene

Exploration of metaphysics in light of the supposition that it is at an end. Readings from classics and critics in philosophy, religion, and literature. WR, HU

* **RLST 306a, Ethics of Forgiveness** Andrew Forsyth

What does it mean to forgive? Is forgiveness a cross-cultural phenomenon – a human universal? Or are forgiveness's assumptions and practices reliant on particular cultural, religious, or philosophical underpinnings? This seminar proceeds historically and thematically. We move from Ancient Greece and Rome, through early Judaism and Christianity and the thought world of medieval Europe, to early-modern, modern, and post-modern philosophical, theological, and literary terrains. And we ask questions such as: Who can forgive? Which reasons (if any) are needed to forgive? How does divine forgiveness relate to human forgiveness? Can states or nations forgive? And is forgiving a virtue, a duty, or just a moral option? HU

* **RLST 321a / SAST 362a, Hindus and Muslims in South Asia** Supriya Gandhi

Study of engagements between Hindu and Muslim traditions in South Asia from medieval to modern times. Exploration of historical case studies of Hindu-Muslim

relations and the formation of religious identities, as well as how memories of the past intersect with modern discourses on religion and politics. HU

* **RLST 368b / EVST 368b / HIST 491Jb / HSHM 479b, The History of the Earth from Noah to Darwin** Ivano Dal Prete

Young earth creationism and flood geology have long been among the most divisive features of American culture and politics. Yet a basic postulate is shared across the spectrum: for better or worse, the old age of the Earth is regarded as the recent product of a secular science, consistently rejected by traditional Christianity. This seminar challenges this long-established narrative, by uncovering the surprising boldness, complexity, and societal diffusion of pre-modern debates on the history of the Earth, and of humankind itself. Students have opportunity to explore the nature, assumptions, and methods of Earth sciences before the advent of modern geology, to question ingrained assumptions about their relation to religion and society, and to place outstanding issues into historical perspective. How have the great monotheistic religions dealt with the possibility of an ancient Earth? Was a young creation always important in traditional Christianity? If not, what led to the emergence of young Earth creationism as a force to be reckoned with? What are the intellectual roots of American preadamism, which claims that the black and white races were created at different times and do not descend from the same ancestor? These and other questions are addressed not only through scholarly literature in the field, but also with the analysis of literary, visual, and material sources available on campus. WR, HU

* **RLST 390a / RUSS 228a, Russian Religious Culture in Thought and Practice** Harvey Goldblatt

Examination of the Russian Religious Culture through the centuries, from the origins of an Old Rus' spiritual civilization in the 11th century to the emergence of post-Soviet literature and art forms in the late-20th and early-21st centuries. Representative works in literature and the visual arts, which deal with both elite and popular culture as well as religious and secular modes of discourse, are chosen from both old Russian bookish culture to the new Russian cultural trends that have their origins in the seventeenth century. All works are examined against a broad comparative background to illustrate the variant and invariants in the long history of Russian religious culture. Special attention is devoted to (1) diverse interpretive approaches and methodological perspectives, (2) traditional and innovative theories of literary and artistic expression, and (3) the connections between cultural activity and ideological trends. All readings and discussions are in English. HU

Advanced Topics in Religious Studies (Group D)

* **RLST 400a / JDST 256a / MMES 236a / NELC 232a, The Dead Sea Scrolls: The Damascus Document** Steven Fraade

Study of the Damascus Document, one of the most important of the Dead Sea Scrolls. Attention to the document's place in the history of biblical interpretation and ancient Jewish law; the nature and rhetorical function of its textual practices, both narrative and legal; and its relation to the central sectarian writings of the Qumran community. Prerequisite: reading proficiency in ancient Hebrew. L5, HU

* **RLST 407a / JDST 391a / NELC 381a, Midrash Seminar: Sifre Shofetim** Steven Fraade

Close study of the earliest rabbinic commentary to the Book of Deuteronomy, focusing on its interpretations of laws dealing with the responsibilities of courts and public figures: judges, kings, priests, and prophets. Particular attention is paid to the interrelation of rabbinic legal rhetoric and the hermeneutics of scriptural commentary, with comparisons to other corpora of ancient Jewish and non-Jewish laws. Prerequisite: reading fluency in ancient Hebrew. L5, HU

* **RLST 428b / ANTH 428b / PHIL 493b, Neighbors and Others** Nancy Levene

This course is an interdisciplinary investigation of concepts and stories of family, community, borders, ethics, love, and antagonism. Otherwise put, it concerns the struggles of life with others – the logic, art, ethnography, and psychology of those struggles. The starting point is a complex of ideas at the center of religions, which are given to differentiating "us" from "them" while also identifying values such as the love of the neighbor that are to override all differences. But religion is only one avenue into the motif of the neighbor, a fraught term of both proximity and distance, a contested term and practice trailing in its wake lovers, enemies, kin, gods, and strangers. Who is my neighbor? What is this to ask, and what does the question ask of us? Course material includes philosophy, anthropology, psychology, fiction, poetry, and film. HU

Other Courses

* **RLST 490b, Religion and Society** Eric Greene

Seminar on religion and society. Topics covered vary by year, but may include one or more of the following: ritual and its social functions, different concepts of social life, the operation of violence in social relationships, religion as both champion and critic of society, and theoretical models of religion and society.

* **RLST 491a and RLST 492b, The Senior Essay** Elyahu Stern

Students writing their senior essays meet periodically in the fall and weekly in the spring for a colloquium directed by the director of undergraduate studies. The essay, written under the supervision of a member of the department, should be a substantial paper between 12,500 and 15,000 words.

Russian and East European Studies

Director of undergraduate studies: Edyta Bojanowska (edyta.bojanowska@yale.edu), 341 RKZ, 432-1301; language coordinator: Irina Dolgova (irina.dolgova@yale.edu), Arnold Hall A36, 432-1307; slavic.yale.edu

The major in Russian and East European Studies, administered by the Department of Slavic Languages and Literatures, offers an interdisciplinary approach to the study of a broad region: Russia, Ukraine, Belarus, the Caucasus, and central Asia; Poland, Hungary, the Czech and Slovak Republics, and other areas in east central Europe; and the Balkans. The program is appropriate for students considering careers in international public policy, diplomacy, or business, and is also suited to students wishing to continue academic work.

REQUIREMENTS OF THE MAJOR

Thirteen term courses taken for a letter grade are required for the major. Students must take one course in Russian or East European history selected in consultation with the director of undergraduate studies (DUS). If Russian is presented as the primary language to satisfy the requirements of the major, then all East European language courses and third- and fourth-year Russian courses count toward the major. If an East European language other than Russian is presented as the primary language, then all courses in that language designated L3 or higher count toward the major. Electives are chosen in consultation with the DUS from an annual list of offerings. Electives must include at least one course in a social science. Other undergraduate courses relevant to Russian and East European Studies, including residential college seminars, may also count toward the major if approved by the DUS.

Languages A full understanding of the area demands knowledge of its languages. Students must demonstrate either proficiency in Russian or intermediate-level ability in an East European language. Students may demonstrate proficiency in Russian by (1) completing fourth-year Russian (RUSS 160, 161); (2) passing a written examination to demonstrate equivalent ability; or (3) completing a literature course taught in Russian and approved by the DUS. Students may demonstrate intermediate-level ability in an East European language by (1) completing a two-year sequence in an East European language (currently Czech, Polish, Romanian, or Ukrainian; students interested in studying other East European languages should contact the DUS); or (2) by passing a language examination demonstrating equivalent ability. Students are encouraged to learn more than one language.

SENIOR REQUIREMENT

Every major must write a senior essay in RSEE 490, 491. At the beginning of the senior year, students enroll in RSEE 490 and arrange for a faculty member to serve as senior adviser. By the third Friday of October, majors submit a detailed prospectus of the essay, with bibliography, to the adviser. A draft of at least ten pages of the text of the essay, or a detailed outline of the entire essay, is due to the adviser by the last day of reading period of the fall semester. The student provides the adviser with a form that the adviser signs to notify the DUS that the first-term requirements for the senior essay have been met. Failure to meet these requirements results in loss of credit for RSEE 490. The senior essay takes the form of a substantial article, no longer than

13,000 words, excluding footnotes and bibliography. Three copies of the essay are due in the Slavic departmental office by April 10, 2020. A member of the faculty other than the adviser grades the essay.

ADVISING

Qualified students may elect pertinent courses in the Graduate School with the permission of the instructor, the director of graduate studies, and the DUS.

Graduate work The European and Russian Studies program does not offer the simultaneous award of the B.A. and M.A. However, students in Yale College are eligible to complete the M.A. in European and Russian Studies (with concentration in Russia and eastern Europe) in one year of graduate work. Students interested in this option must complete eight graduate courses in the area by the time they complete the bachelor's degree. Only two courses may be counted toward both the graduate degree and the undergraduate major. Successful completion of graduate courses while still an undergraduate does not guarantee admission into the M.A. program. Students must submit the standard application for admission to the M.A. program.

STUDY ABROAD

Students should be aware of opportunities for study and travel in Russia and eastern Europe. The DUS can provide information on these programs and facilitate enrollment. Students who spend all or part of the academic year in the region participating in established academic programs usually receive Yale College credit, and are strongly encouraged to take advantage of study abroad opportunities during summers or through the Year or Term Abroad program. Students wishing to travel abroad as part of the major should consult the DUS.

REQUIREMENTS OF THE MAJOR

Prerequisite None

Number of courses 13 term courses (incl senior essay and specified lang courses)

Distribution of courses Demonstrated proficiency in Russian or intermediate-level ability in an East European lang; 1 course in Russian or East European hist approved by DUS; at least 1 course in social science

Senior requirement Senior essay (RSEE 490, 491)

FACULTY ASSOCIATED WITH THE MAJOR

Professors Sergei Antonov (*History*), Edyta Bojanowska (*Slavic Languages & Literatures*), Paul Bushkovitch (*History*), Katerina Clark (*Comparative Literature, Slavic Languages & Literatures*), John Gaddis (*History*), Harvey Goldblatt (*Slavic Languages & Literatures*), John MacKay (*Slavic Languages & Literatures, Film & Media Studies*), Timothy Snyder (*History*)

Associate Professors Molly Brunson (*Slavic Languages & Literatures*), Jason Lyall (*Political Science*), Douglas Rogers (*Anthropology*), Marci Shore (*History*)

Assistant Professors Marijeta Bozovic (*Slavic Languages & Literatures, Film and Media Studies, Women's, Gender, & Sexuality Studies*), Marta Figlerowicz (*Comparative Literature, English*)

Senior Lectors II Irina Dolgova, Constantine Muravnik

Senior Lectors Krystyna Illakowicz, Julia Titus, Karen von Kunes

Courses

RSEE 225a / HIST 290a, Russia from the Ninth Century to 1801 Paul Bushkovitch

The mainstream of Russian history from the Kievan state to 1801. Political, social, and economic institutions and the transition from Eastern Orthodoxy to the Enlightenment. HU

RSEE 254a / LITR 245a / RUSS 254a, Tolstoy and Dostoevsky Molly Brunson

Close reading of major novels by two of Russia's greatest authors. Focus on the interrelations of theme, form, and literary-cultural context. Readings and discussion in English. HU

RSEE 268b / HIST 264b, Eastern Europe since 1914 Staff

Eastern Europe from the collapse of the old imperial order to the enlargement of the European Union. Main themes include world war, nationalism, fascism, and communism. Special attention to the structural weaknesses of interwar nation-states and postwar communist regimes. Nazi and Soviet occupation as an age of extremes. The collapse of communism. Communism after 1989 and the dissolution of Yugoslavia in the 1990s as parallel European trajectories. HU

RSEE 271a / HIST 271a / HUMS 339a, European Intellectual History since Nietzsche

Marci Shore

Major currents in European intellectual history from the late nineteenth century through the twentieth. Topics include Marxism-Leninism, psychoanalysis, expressionism, structuralism, phenomenology, existentialism, antipolitics, and deconstruction. HU

* **RSEE 300b / CZEC 301b / LITR 220b, Milan Kundera: The Czech Novelist and French Thinker** Karen von Kunes

Close reading of Kundera's novels, with analysis of his aesthetics and artistic development. Relationships to French, German, and Spanish literatures and to history, philosophy, music, and art. Topics include paradoxes of public and private life, the irrational in erotic behavior, the duality of body and soul, the interplay of imagination and reality, the function of literary metaphor, and the art of composition. Readings and discussion in English. HU TR

RSEE 312b / HUMS 255b / RUSS 312b, Tolstoy's *War and Peace* Edyta Bojanowska

A study of Leo Tolstoy's masterpiece *War and Peace* (1865–1869) about Napoleon's 1812 invasion of Russia, in philosophical, historical, and political contexts. All readings and class discussions in English. WR, HU TR

* **RSEE 327a / FILM 409a / LITR 306a / RUSS 327a, The Danube in Literature and Film** Marijeta Bozovic

The Danube River in the film, art, and literature of various Danubian cultural traditions, from the late nineteenth century to the present. Geography and history of the region that includes the river's shores and watershed; physical, historical, and metaphoric uses of the Danube; the region as a contested multilingual, multicultural, and multinational space, and as a quintessential site of cross-cultural engagement. Readings and discussion in English. WR, HU TR

RSEE 400a / PLSC 400a, Legacies of Communism and Conflict in Europe Andrea Aldrich

This course examines the challenges of democratic transition and consolidation in Europe in an exciting way using contemporary and historical political research, documentary and dramatic film, a graphic non-fiction novel, and a field trip to MOMA in NYC (optional). Together we explore political themes like authoritarianism, state collapse, nationalism, ethnic conflict, transitional justice, and democratic development through the turbulent political history of Southeastern Europe, which provides a solid theoretical foundation for the understanding of past and current events around the world. SO

* **RSEE 490a and RSEE 491b, The Senior Essay** Staff

Preparation of the senior essay under faculty supervision. The essay grade becomes the grade for both terms of the course. Required of all seniors majoring in Russian and East European Studies. Credit for RSEE 490 only on completion of RSEE 491.

RELATED COURSES THAT COUNT TOWARD THE MAJOR

Students are encouraged to examine the offerings in Slavic Languages and Literatures and other departments, as well as residential college seminars, for additional related courses that may count toward the major.

HIST 263a, Eastern Europe to 1914 Timothy Snyder

Eastern Europe from the medieval state to the rise of modern nationalism. The Ottoman Empire, the Polish-Lithuanian Commonwealth, the Hapsburg monarchy, and various native currents. Themes include religious diversity, the constitution of empire, and the emergence of secular political ideologies. HU

HIST 264b / RSEE 268b, Eastern Europe since 1914 Staff

Eastern Europe from the collapse of the old imperial order to the enlargement of the European Union. Main themes include world war, nationalism, fascism, and communism. Special attention to the structural weaknesses of interwar nation-states and postwar communist regimes. Nazi and Soviet occupation as an age of extremes. The collapse of communism. Communism after 1989 and the dissolution of Yugoslavia in the 1990s as parallel European trajectories. HU

Science

Yale College offers a yearlong interdepartmental course sequence for first-year students with strong preparation in the sciences who do not intend to major in science. SCIE 030 and 031, Current Topics in Science, presents a broader range of topics than standard courses and highlights the interdependence of the scientific disciplines. Application information is available on the First-Year Seminar website.

Courses

*** SCIE 030a and SCIE 031b, Current Topics in Science** Douglas Kankel

A series of modules in lecture and discussion format addressing scientific issues arising in current affairs. Topics are selected for their scientific interest and contemporary relevance, and may include global warming, human cloning, and the existence of extrasolar planets. Credit for SCIE 030 upon completion of SCIE 031; one course credit is awarded for successful completion of the year's work. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SC ½ Course cr per term

Slavic Languages and Literatures

Director of undergraduate studies: Edyta Bojanowska (edyta.bojanowska@yale.edu), 341 RKZ, 432-1301; language coordinator: Irina Dolgova (irina.dolgova@yale.edu), Arnold Hall A36, 432-1307; slavic.yale.edu

The major in Russian offered by the Department of Slavic Languages and Literatures acquaints students with Russian literature and culture, develops students' appreciation of literary values and skill in literary analysis, and gives them a basic competence in Russian. For an area major in Russian studies, see Russian and East European Studies, an interdisciplinary program administered by the Department of Slavic Languages and Literatures.

Students majoring in Russian may concentrate exclusively on Russian language and literature (Program I), or they may elect to study Russian literature in the context of comparative studies of literature (Program II). For Program II, credit is given for work done in other departments. Specific courses in each program must be arranged with the director of undergraduate studies (DUS). Students interested in specializing in Russian or Slavic linguistics may arrange a special concentration in linguistics with the DUS.

PREREQUISITES

Prerequisite to the major in both programs is RUSS 151. The department offers two sequences of language courses to fulfill the prerequisite: either (1) RUSS 110, 120, 130, 140, 150, and 151 or (2) RUSS 125, 145, 150, and 151. Prospective majors should complete RUSS 140 or 145 by the end of their sophomore year or accelerate their course of study by taking summer courses or studying abroad. While completing the prerequisite, students are encouraged to begin fulfilling requirements of the major that do not presuppose advanced knowledge of Russian by taking courses in Russian history and Russian literature in translation.

PLACEMENT PROCEDURES

Students who have previously studied Russian formally or informally are required to take the Russian placement exam. This brief oral exam helps determine which Russian course best fits each student's background. Contact the Russian language coordinator, Irina Dolgova (irina.dolgova@yale.edu), to schedule the oral placement exam or for information about preregistration. She may be reached via email or at 432-1307. Entering first-year students who have some knowledge of Czech or Polish should contact Krystyna Illakowicz (krystyna.illakowicz@yale.edu) (Polish) or Karen von Kunes (karen.vonkunes@yale.edu) (Czech) to arrange to take a brief placement examination.

REQUIREMENTS OF THE MAJOR

In addition to the prerequisite, the major in Russian requires at least eleven term courses, which must include the following (some courses may fulfill more than one requirement):

1. Fourth-year Russian: RUSS 160 and 161.
2. Two terms of Russian literature in translation: RUSS 250 and 253.
3. Two terms of Russian literature read and discussed in the original language, typically selected from Group A courses numbered 170 or above.

4. At least two term courses in Russian literature of the nineteenth century and two in Russian literature of the twentieth century. Students should select courses from Group A and from the 250 series with this requirement in mind.
5. RUSS 490. The senior essay is the intellectual culmination of the student's work in the major. All primary sources used in the essay must be read in Russian.

In addition to the requirements above, each program requires the following:

Program I One term course in the history or culture of Russia, selected in consultation with the DUS; three additional term courses in the Department of Slavic Languages and Literatures above RUSS 151. These may include literature courses taught either in translation or in the original, advanced language training courses, or graduate courses.

Program II Four term courses outside the Department of Slavic Languages and Literatures that are relevant to the major in the context of comparative studies of literature, selected in consultation with the DUS.

SENIOR REQUIREMENT

All majors write a senior essay (RUSS 490), an independent project carried out under the guidance of a faculty member. Three copies of the essay are due in the Slavic departmental office on April 10, 2020.

ADVISING

Courses in the Graduate School are open to qualified undergraduates with permission of the instructor and of the director of graduate studies. Course descriptions are available at the office of the DUS.

STUDY ABROAD

Students majoring in Russian are strongly encouraged to spend a summer or a term studying in the Russian Federation under the auspices of programs approved by the DUS. Language courses taken during the summer or during a term in Russia in approved programs may substitute for certain advanced Russian courses at Yale. Students interested in study abroad should consult the DUS well before their junior year.

REQUIREMENTS OF THE MAJOR

Prerequisite RUSS 151

Number of courses 11 term courses beyond prereq (incl senior essay)

Specific courses required *Both programs* – RUSS 160, 161, 250, 253

Distribution of courses *Both programs* – 2 terms of 19th-century Russian lit; 2 terms of 20th-century Russian lit; 2 Russian lit courses from Group A numbered 170 or above; *Program I* – 1 course in hist or culture of Russia; 3 courses in dept of Slavic Langs and Lits above level of RUSS 151; *Program II* – 4 courses relevant to major in other depts, with DUS approval

Senior requirement Senior essay (RUSS 490)

CERTIFICATE OF ADVANCED LANGUAGE STUDY

The Department of Slavic Languages and Literatures offers a Certificate of Advanced Language Study in Russian. A certificate adviser, typically the director of undergraduate studies (DUS), advises students on the certification process and certifies to the

University Registrar's Office that students have completed the stated requirements before the end of eight terms of study. The Certificate of Advanced Language Study, once certified, is listed on student transcripts.

REQUIREMENTS

Students seeking to earn the certificate are required to take four courses beyond the L4 level in their chosen language, at least two of which must be Yale courses designated as L5. Students should take L5 content courses only after they have completed RUSS 151, Third-Year Russian II. All courses must be taken for a letter grade, and students must achieve a grade of B or above. With the approval of the adviser, one advanced non-L5 course, conducted in the target language, such as an independent study course, a graduate seminar, or an advanced seminar may count toward certification requirements.

The certificate adviser may allow one "language across the curriculum" (LxC) course, which ordinarily is an advanced seminar with an additional weekly discussion section in the target language, to count toward the certification requirements. The certificate adviser may also approve the substitution of up to two credits earned during study abroad and taught in the target language to count toward the certificate requirements. If the adviser approves courses taken outside of Yale for inclusion in the certificate requirements, students must take the necessary steps to ensure those courses appear on their transcript.

Credit/D/Fail No courses taken Credit/D/Fail may be counted toward the requirements of the certificate.

FACULTY OF THE DEPARTMENT OF SLAVIC LANGUAGES AND LITERATURES

Professors Edyta Bojanowska (*Slavic Languages and Literatures*), Katerina Clark (*Comparative Literature, Slavic Languages and Literatures*), Harvey Goldblatt (*Slavic Languages and Literatures*), John MacKay (*Film & Media Studies, Slavic Languages and Literatures*)

Associate Professor Molly Brunson (*Slavic Languages and Literatures*)

Assistant Professor Marijeta Bozovic (*Slavic Languages and Literatures*)

Senior Lectors II Irina Dolgova (*Slavic Languages and Literatures*), Constantine Muravnik (*Slavic Languages and Literatures*)

Senior Lectors I Krystyna Illakowicz (*Slavic Languages and Literatures*), Julia Titus (*Slavic Languages and Literatures*), Karen von Kunes (*Slavic Languages and Literatures*)

Czech, Polish, Romanian, and Ukrainian Courses

CZEC 110a, Elementary Czech I Karen von Kunes

A comprehensive introduction to Czech for students with no previous knowledge of the language. Essentials of grammar, with emphasis on oral proficiency, reading, writing, and listening comprehension. Online articles, annotated excerpts from Capek's *R.U.R.*, Hasek's *Svejk*, Kundera's *Joke* and *Unbearable Lightness of Being*, and Havel's *Private View*. Audio- and videotapes. L1 RP 1½ Course cr

CZEC 120b, Elementary Czech II Karen von Kunes

Continuation of CZEC 110. After CZEC 110 or equivalent. L2 RP 1½ Course cr

CZEC 130a, Intermediate Czech Karen von Kunes

Continuation of CZEC 120. Grammar and usage, with emphasis on idiomatic expressions, syntax, and stylistics. Readings in modern Czech history, prose, and poetry; discussion of economic, political, and social issues. After CZEC 120 or equivalent. L3 RP 1½ Course cr

CZEC 140b, Advanced Czech Karen von Kunes

Continuation of CZEC 130. Emphasis on writing skills and spoken literary Czech. After CZEC 130 or equivalent. L4 RP 1½ Course cr

PLSH 110a, Elementary Polish I Krystyna Illakowicz

A comprehensive introduction to elementary Polish grammar and conversation, with emphasis on spontaneous oral expression. Reading of original texts, including poetry. Use of video materials. L1 RP 1½ Course cr

PLSH 120b, Elementary Polish II Krystyna Illakowicz

Continuation of PLSH 110. After PLSH 110 or equivalent. L2 RP 1½ Course cr

PLSH 130a, Intermediate Polish I Krystyna Illakowicz

A reading and conversation course conducted in Polish. Systematic review of grammar; practice in speaking and composition; reading of selected texts, including poetry. Use of video materials. After PLSH 120 or equivalent. L3 RP 1½ Course cr

PLSH 140b, Intermediate Polish II Krystyna Illakowicz

Continuation of PLSH 130. After PLSH 130 or equivalent. L4 RP 1½ Course cr

*** PLSH 150a, Advanced Polish** Krystyna Illakowicz

Improvement of high-level language skills through reading, comprehension, discussion, and writing. Focus on the study of language through major literary and cultural texts, as well as through film and other media. Exploration of major historical and cultural themes. Prerequisite: PLSH 140 or equivalent. L5

*** ROMN 110a, Elementary Romanian I** Staff

The first half of a two-term introduction to Romanian language, grammar, and cultural literacy centered around the theme of life in Bucharest. Topics, vocabulary, and grammar lessons based on everyday linguistic interactions in the city. Course taught through distance learning using videoconferencing technology from Columbia University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L1 RP 1½ Course cr

*** ROMN 120b, Elementary Romanian II** Staff

The second half of a two-term introduction to Romanian language, grammar, and cultural literacy centered around the theme of life in Bucharest. Topics, vocabulary, and grammar lessons based on everyday linguistic interactions in the city. Prerequisite: ROMN 110. Course taught through distance learning using videoconferencing technology from Columbia University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L2 RP 1½ Course cr

*** ROMN 130a, Intermediate Romanian I** Staff

Continuation of ROMN 120, with attention to all four language skills and to cultural literacy. Students reach B2 level in compliance with the Common European Framework of Reference for Languages (CEFRL). Prerequisite: ROMN 120 or equivalent.

Course taught through distance learning using videoconferencing technology from Columbia University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L3 RP 1½ Course cr

*** ROMN 140b, Intermediate Romanian II** Staff

Continuation of ROMN 130, with attention to all four language skills and to cultural literacy. Students reach C1 level in compliance with the Common European Framework of Reference for Languages (CEFRL). Course taught through distance learning using videoconferencing technology from Columbia University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L4 RP 1½ Course cr

*** UKRN 110a, Elementary Ukrainian I** Staff

The first half of a two-term introduction to Ukrainian for students with no previous knowledge of the language. Emphasis on speaking, reading, listening, and writing skills. Topics, vocabulary, and grammar lessons based on everyday linguistic interactions. Course taught through distance learning using videoconferencing technology from Columbia University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L1 RP 1½ Course cr

*** UKRN 120b, Elementary Ukrainian II** Staff

The second half of a two-term introduction to Ukrainian for students with no previous knowledge of the language. Emphasis on speaking, reading, listening, and writing skills. Topics, vocabulary, and grammar lessons based on everyday linguistic interactions. Prerequisite: UKRN 110. Course taught through distance learning using videoconferencing technology from Columbia University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L2 1½ Course cr

*** UKRN 140b, Intermediate Ukrainian II** Staff

Continued review and reinforcement of grammar fundamentals and of core vocabulary pertaining to common aspects of daily life. Special attention to verbal aspect and verbs of motion. Emphasis on further development of oral and written communication skills on topics such as the self, family, studies and leisure, travel, and meals. UKRN 130 or equivalent. Course taught through distance learning using videoconferencing technology from Columbia University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L4 RP 1½ Course cr

Group A Courses

Unless otherwise noted, all Group A courses are conducted in Russian.

RUSS 110a, First-Year Russian I Julia Titus

A video-based course designed to develop all four language skills: reading, writing, speaking, and listening comprehension. Use of dialogues, games, and role playing. In addition to readings in the textbook, students read original short stories and learn Russian songs and poems. Oral and written examinations. L1 RP 1½ Course cr

RUSS 120b, First-Year Russian II Staff

Continuation of RUSS 110. After RUSS 110 or equivalent. L2 RP 1½ Course cr

RUSS 125a, Intensive Elementary Russian Constantine Muravnik

An intensive course that covers in one term the material taught in RUSS 110 and 120. For students of superior linguistic ability. Study of Russian grammar; practice in conversation, reading, and composition. Recommended for prospective majors in Russian and in Russian and East European Studies. L1, L2 RP 2 Course cr

RUSS 130a, Second-Year Russian I Irina Dolgova

A course to improve functional competence in all four language skills (speaking, writing, reading, and listening comprehension). Audio activities, for use both in the classroom and independently, are designed to help students improve their listening comprehension skills and pronunciation. Lexical and grammatical materials are thematically based. After RUSS 120 or equivalent. L3 RP 1½ Course cr

RUSS 140b, Second-Year Russian II Irina Dolgova

Continuation of RUSS 130. After RUSS 130 or equivalent. L4 RP 1½ Course cr

RUSS 145b, Intensive Intermediate Russian Constantine Muravnik

A continuation of RUSS 125 that covers in one term the material taught in RUSS 130 and 140. For students of superior linguistic ability. Prerequisite: RUSS 125. L3, L4 RP 2 Course cr

RUSS 150a, Third-Year Russian I Constantine Muravnik

Intensive practice in conversation and composition accompanied by review and refinement of grammar. Readings from nineteenth- and twentieth-century literature, selected readings in Russian history and current events, and videotapes and films are used as the basis of structured conversation, composition, and grammatical exercises. Oral and written examinations. Audiovisual work in the Center for Language Study required. After RUSS 140 or 145 or equivalent. L5 RP 1½ Course cr

RUSS 151b, Third-Year Russian II Constantine Muravnik

Continuation of RUSS 150. After RUSS 150 or equivalent. L5 RP 1½ Course cr

RUSS 160a, Fourth-Year Russian I Irina Dolgova

Discussion topics include Russian culture, literature, and self-identity; the old and new capitals of Russia, the cultural impact of the Russian Orthodox Church, and Russia at war. Readings from mass media, textbooks, and classic and modern literature. Use of video materials. After RUSS 151 or equivalent. L5

RUSS 161b, Fourth-Year Russian II Irina Dolgova

Continuation of RUSS 160. After RUSS 160 or equivalent. L5

*** RUSS 172a, Russian History through Literature and Film** Irina Dolgova

Study of important events in Russian history, from the medieval times to the present, through authentic reading materials in various genres and through feature and documentary films. The course is designed to advance students' speaking proficiency in Russian and to develop their reading, listening, and writing skills. Texts include Russian fairy tales; fragments from *The Primary Chronicles*; A. Tolstoy's *Peter I*; D. Merezhkovsky's *Antichrist*; N. Eidelman's *Decembrists*; P. Chaadaev's *Philosophical Letters*; N. Leskov's *Enchanted Wanderer* (fragments); and I. Goncharov's *Oblomov* (fragments). Films include A. Tarkovsky's *Andrei Rublev*; N. Mikhalkov's *Several Days from Oblomov's Life*; A. Askoldov's *Comissar*; Todorovsky's *Stiliagi*; K. Muratova's *Asthenic Syndrome*; and A. Zviagintsev's *Loveless*. All written assignments, texts, and

discussions are in Russian. Prerequisite: RUSS 142 or 151, or permission of instructor.
L5, HU

* **RUSS 178b, The Short Story in Russian** Julia Titus

Chronological study of celebrated Russian short stories. Authors include Pushkin, Gogol, Tolstoy, Dostoevsky, Chekhov, Nabokov, and Tolstaya. Readings and discussion in Russian. Prerequisite: RUSS 140, 145, or equivalent. L5, HU

* **RUSS 179b, The Grotesque in Victor Pelevin** Constantine Muravnik

Novels and short stories by a contemporary Russian writer, Victor Pelevin. Focus on Pelevin's major novel, *Chapaev i Pustota*, the theory of the grotesque, and on the relationship between imagination and reality. Diverse conceptions of the grotesque; the ethical and aesthetic significance of the conflict between the real and the fantastic; Pelevin's place in the specifically Russian grotesque tradition of Gogol and Nabokov. Prerequisite: RUSS 142, 151 or permission of instructor. L5, HU RP

Group B Courses

The courses in this group, conducted in English, are open to all Yale College students.

* **CZEC 301b / LITR 220b / RSEE 300b, Milan Kundera: The Czech Novelist and French Thinker** Karen von Kunes

Close reading of Kundera's novels, with analysis of his aesthetics and artistic development. Relationships to French, German, and Spanish literatures and to history, philosophy, music, and art. Topics include paradoxes of public and private life, the irrational in erotic behavior, the duality of body and soul, the interplay of imagination and reality, the function of literary metaphor, and the art of composition. Readings and discussion in English. HU TR

* **PLSH 248b / THST 370b, Polish Theater and Its Traditions** Krystyna Illakowicz

Exploration of the rebellious, defiant, and explosive nature of Polish theater, including ways in which theater has challenged, ridiculed, dissected, and disabled oppressive political power. Polish experimental and absurdist traditions that resulted from a merger of the artistic and the political; environmental and community traditions of the Reduta Theatre; Polish-American theater connections. Includes attendance at live theater events as well as meetings with Polish theater groups and actors. HU TR

* **RUSS 228a / RLST 390a, Russian Religious Culture in Thought and Practice** Harvey Goldblatt

Examination of the Russian Religious Culture through the centuries, from the origins of an Old Rus' spiritual civilization in the 11th century to the emergence of post-Soviet literature and art forms in the late-20th and early-21st centuries. Representative works in literature and the visual arts, which deal with both elite and popular culture as well as religious and secular modes of discourse, are chosen from both old Russian bookish culture to the new Russian cultural trends that have their origins in the seventeenth century. All works are examined against a broad comparative background to illustrate the variant and invariants in the long history of Russian religious culture. Special attention is devoted to (1) diverse interpretive approaches and methodological perspectives, (2) traditional and innovative theories of literary and artistic expression, and (3) the connections between cultural activity and ideological trends. All readings and discussions are in English. HU

*** RUSS 253a, Masterpieces of Russian Literature II** Staff

A survey of major writers and literary movements, focusing on the intersection of art and revolution in twentieth-century Russian literature. The Symbolists and Decadents at the end of the nineteenth century; the reception of the 1917 Revolution by Russian writers in the 1920s; the formation of Stalinist literary orthodoxy and reactions against it; contemporary literary rebellions against the political and artistic legacies of the past. Works by Chekhov, Bely, Babel, Akhmatova, Bulgakov, Pasternak, and Pelevin. Readings and discussion in English. HU TR

RUSS 254a / LITR 245a / RSEE 254a, Tolstoy and Dostoevsky Molly Brunson

Close reading of major novels by two of Russia's greatest authors. Focus on the interrelations of theme, form, and literary-cultural context. Readings and discussion in English. HU TR

RUSS 260b / LITR 202b, Nabokov and World Literature Marijeta Bozovic

Vladimir Nabokov's writings explored in the context of his life story and of the structures and institutions of literary life in Russian émigré circles. Themes of exile, memory, and nostalgia; hybrid cultural identities and cosmopolitan elites; language and bilingualism; the aims and aesthetics of émigré and diasporic modernism in novels and other media. Additional readings from works of world literature inspired and influenced by Nabokov. Readings and discussion in English. WR, HU

RUSS 312b / HUMS 255b / RSEE 312b, Tolstoy's War and Peace Edyta Bojanowska

A study of Leo Tolstoy's masterpiece *War and Peace* (1865–1869) about Napoleon's 1812 invasion of Russia, in philosophical, historical, and political contexts. All readings and class discussions in English. WR, HU TR

*** RUSS 327a / FILM 409a / LITR 306a / RSEE 327a, The Danube in Literature and Film** Marijeta Bozovic

The Danube River in the film, art, and literature of various Danubian cultural traditions, from the late nineteenth century to the present. Geography and history of the region that includes the river's shores and watershed; physical, historical, and metaphorical uses of the Danube; the region as a contested multilingual, multicultural, and multinational space, and as a quintessential site of cross-cultural engagement. Readings and discussion in English. WR, HU TR

*** RUSS 403b / FILM 442b / LITR 403b, The City in Literature and Film** Katerina Clark

Consideration of the architecture, town planning, and symbolic functions of various cities in Europe, Latin America, the United States, and East Asia. Discussion of the representation of these cities in literature and film. Works include older Soviet and Chinese films about Shanghai and contemporary films about Hong Kong and Beijing. HU

Group C Courses

*** RUSS 481b, Directed Reading in Russian Literature** Staff

Individual study under the supervision of a faculty member selected by the student. Applicants must submit a prospectus approved by the adviser to the director of undergraduate studies by the end of the first week of classes in the term in which the course is taken. The student meets with the adviser at least one hour each week,

and takes a final examination or writes a term paper. No credit granted without prior approval of the director of undergraduate studies.

* **RUSS 490a or b, The Senior Essay** Staff

Research and writing on a topic of the student's own devising. Regular meetings with an adviser as the work progresses from prospectus to final form.

Sociology

Director of undergraduate studies: Jonathan Wyrzten (jonathan.wyrzten@yale.edu); sociology.yale.edu

Sociology provides the theoretical and empirical foundation for understanding how societies function and how they change over time. Sociologists are interested in the causes and consequences of processes such as the social construction of groups and identity, the evolution of culture, intersubjective meanings, intergroup relations, and hierarchies and social norms. They conduct research on individual behavior and outcomes such as educational attainment, jobs and careers, religious commitment, and political involvement; interpersonal processes such as intimate relationships, sexuality, social interaction in groups, and social networks; the behaviors of organizations and institutions; the causes and consequences of group differences and social inequality; and social change at the societal and global level.

The Sociology major provides both a solid foundation for students interested in careers in the social sciences and a strong background for a variety of professions in which knowledge about social processes and how societies work is relevant. Many recent graduates have gone on to law school, medical school, or graduate programs in public health, business, education, urban planning, criminology, and sociology. Others work in finance, consulting, publishing, marketing, city planning, teaching, research, and advocacy.

The Sociology department offers four undergraduate programs leading to the B.A. degree: (1) the standard program focuses on sociological concepts, theories, and methods; (2) a combined program allows students to combine sociology with a concentration in another field; (3) a concentration in markets and society focuses on the cultural frameworks, social ties, and social institutions that give rise to markets and that shape economic behavior; (4) a concentration in health and society emphasizes social processes as they affect health and medicine. Students interested in the major are encouraged to contact the director of undergraduate studies (DUS) early in their academic careers to discuss potential options.

COURSE NUMBERING

Courses in Sociology are divided by level, with introductory courses numbered from 110–149, courses in sociological theory from 150–159, courses in sociological methods from 160–169, intermediate courses from 150–299, advanced courses in the 300s, and individual study and research courses in the 400s. First-year seminars are numbered below 100 and count as introductory or intermediate courses.

PREREQUISITE

Students interested in the Sociology major should complete either a first-year seminar or at least one introductory course (numbered SOCY 110–149), ideally by the end of the sophomore year. This course may be applied toward the requirements of the major. The DUS can waive the introductory course requirement for students who demonstrate adequate preparation for advanced course work in sociology.

REQUIREMENTS OF THE MAJOR

Program I. The standard major The requirements for the standard major are:

1. Thirteen term courses in sociology (including the prerequisite and senior colloquium), of which normally no more than two may be drawn from outside the Sociology department. At least one must be an introductory Sociology course or a substitute approved by the DUS, but no more than two introductory courses may count toward the total.
2. Two courses in sociological theory and two in sociological methods, normally completed by the end of the junior year. SOCY 151 and 152 are the required courses for theory. SOCY 160 and one additional Sociology course numbered SOCY 161–169 are required for methods. Other methods courses from outside the department can be approved at the discretion of the DUS. Students planning to study abroad in their junior year are strongly encouraged to begin meeting the theory and methods requirements in their sophomore year. They should also discuss the options for their course of study with the DUS before finalizing their plans.
3. One advanced seminar in Sociology (SOCY 300–399).
4. The senior requirement.

Program II. Sociology with another subject The combined program allows students to unite the study of sociology with the study of another discipline or substantive area, and to design a program that satisfies their own interests and career plans. By the beginning of the junior year, participants in the combined program are expected to consult with the DUS in order to obtain approval for their course of study. The requirements for Program II are:

1. Thirteen term courses (including the prerequisite and senior colloquium), of which at least nine and no more than ten are selected from Sociology, the remainder being chosen from another department or program. At least one must be an introductory Sociology course or a substitute approved by the DUS, but no more than two introductory courses in any department or program may count toward the total. The courses outside Sociology must constitute a coherent unit alone and form a logical whole when combined with the Sociology courses.
2. Two courses in sociological theory and two in sociological methods, normally completed by the end of the junior year. SOCY 151 and 152 are the required courses for theory. SOCY 160 and one additional Sociology course numbered SOCY 161–169 are required for methods. Other methods courses from outside the department can be approved at the discretion of the DUS. Students planning to study abroad in their junior year are strongly encouraged to begin meeting the theory and methods requirements in their sophomore year. They should also discuss the options for their course of study with the DUS before finalizing their plans.
3. One advanced seminar in Sociology (SOCY 300–399).
4. The senior requirement, integrating sociology and the other subject chosen.

Program III. Concentration in markets and society Students in the markets and society concentration gain a broad understanding of markets and their relationship to social networks, religion, the state, and culture. Students explore the field of economic sociology, develop insights into market logics and economic outcomes, and develop skills in network analysis.

Students in the Class of 2020 and the Class of 2021 With DUS approval, the following changes to the concentration in markets and society may be fulfilled by students who declared their major under previous requirements.

Students in the Class of 2022 and subsequent classes The changes to the concentration in markets and society are:

1. Thirteen term courses in sociology (including the prerequisite and senior colloquium). At least one must be an introductory Sociology course or a substitute approved by the DUS, but no more than two introductory courses in any department or program may count toward the total. Up to four courses may be drawn from outside the Sociology department, with approval from the DUS.
2. SOCY 160 and one theory course (SOCY 151 or 152).
3. SOCY 321 and one additional intermediate or advanced course in economic sociology.
4. At least one intermediate or advanced course in microeconomics (e.g., ECON 121 or 125).
5. The senior requirement, integrating sociology with business, markets, or economic behavior.

Program IV. Concentration in health and society Students in the health and society concentration gain a broad understanding of how supraindividual factors such as socioeconomic inequality, demographic processes, neighborhood environments, cultural norms, and social networks affect health and medical care. Students explore the fields of medical sociology, stratification, demography, and network science. The core courses in the concentration satisfy the social science requirements of premedical programs while also providing a solid foundation for students interested in public health, health policy, and global health. Requirements for the concentration are:

1. Thirteen term courses in Sociology (including the prerequisite and senior colloquium). Up to five course credits may be drawn from outside the Sociology department, with approval from the DUS.
2. SOCY 127, the gateway course for the concentration (or other similar course, with approval of DUS).
3. SOCY 151
4. A course in statistics: SOCY 162, S&DS 103, GLBL 121, or a higher-level statistics course approved by the DUS.
5. SOCY 160 or a comparable course approved by the DUS.
6. In order to build a broad base of interdisciplinary knowledge on health, students may take up to five course credits from outside the Sociology department. It is recommended that students select at least one course credit from the following: BIOL 101, BIOL 102, BIOL 103, BIOL 104; MATH 112 or higher-level MATH course; ECON 170.
7. Two upper-level Sociology seminars (200 or 300 level), or other courses approved by the DUS.
8. The senior requirement, integrating sociology with health and medicine.

Credit/D/Fail courses A maximum of two courses taken Credit/D/Fail may be counted toward the requirements of the major.

SENIOR REQUIREMENTS

For the nonintensive major Students electing the nonintensive major take one additional seminar in Sociology (SOCY 300–399) and write a one-credit senior essay during the senior year (SOCY 491). The senior essay for nonintensive majors is intended to be an in-depth scholarly review and critical analysis based on secondary sources. Students select an important topic in any sociological field and write a literature review that evaluates what is known about the topic. All nonintensive majors are required to enroll in SOCY 491 to receive credit for the senior essay. To register for this course, students must submit a written plan of study approved by a faculty adviser to the DUS no later than the end of registration period in the term in which the senior essay is to be written. Nonintensive majors are not eligible to graduate with Distinction in the Major.

For the intensive major The intensive major gives students an opportunity to undertake a yearlong program of original research resulting in a contribution to sociological knowledge. The yearlong project requires substantial independent research and knowledge of a sociological subfield. Students use research methods such as data gathering through participant observation, in-depth interviewing, administration of small-scale surveys, or secondary analysis of existing data. They may present findings in a variety of forms, from ethnographic narratives to analytical statistics. Students select primary and secondary advisers from the faculty. Students in the intensive major enroll in SOCY 493, 494 during their senior year. The colloquium provides a forum for discussing the research process and for presenting students' research at various stages. Intensive majors are eligible to graduate with Distinction in the Major if they meet the grade standards for Distinction – see the Undergraduate Curriculum, Honors – and submit a senior essay written in SOCY 493, 494.

ADVISING

All students interested in the Sociology major should meet with the DUS no later than the beginning of the junior year to elect a program of study. Qualified students may petition to enroll in graduate courses, with permission of the instructor and the director of graduate studies. A list of graduate courses and descriptions is available from the DUS.

Admission to the intensive major Candidates for the intensive major should apply to the DUS by the last day of classes in the spring term of their junior year. The intensive major is especially recommended for students considering graduate school or social research. In special circumstances, applications may be accepted through the end of registration period in the first term of the senior year. Applications should include a one-page statement of interest that includes a list of relevant courses taken and identifies a prospective senior essay adviser. Admission is based on performance and promise. The DUS and the senior essay adviser serve as advisers to seniors in the intensive major.

STUDY ABROAD

Students planning to study abroad in their junior year are strongly encouraged to begin meeting specific requirements in their sophomore year. They should also discuss the options for their course of study with the DUS before finalizing their plans.

REQUIREMENTS OF THE MAJOR

Prerequisite 1 first-year sem or intro course (SOCY 110–149) or equivalent

Number of courses 13 term courses (incl prereq and senior essay)

Specific courses required *Programs I and II*—SOCY 151, 152, 160, 1 addtl course from SOCY 161–169; *Program III*—SOCY 151 or 152, SOCY 160, SOCY 321; *Program IV*—SOCY 127, SOCY 151, SOCY 160, or a comparable course approved by the DUS

Distribution of courses *Programs I, II, and III*—at least 1, but no more than 2 intro courses; *Program I*—1 sem from SOCY 300–399; *Program II*—9 or 10 courses in Sociology; 3 or 4 courses from another dept; 1 sem from SOCY 300–399; *Program III*—at least 1 intermed or adv course in microecon; *Program IV*—1 course in stat, as specified; 2 upper-level sems, as specified

Substitution permitted *Program I*—up to 2 courses from other depts; *Program III*—up to 4 courses from other depts, with DUS approval; *Program IV*—up to 5 courses from other depts, with DUS approval

Senior requirement *Nonintensive major*—1 addtl 300-level Sociology sem and senior essay (SOCY 491); *Intensive major*—two-term senior essay (SOCY 493, 494)

FACULTY OF THE DEPARTMENT OF SOCIOLOGY

Professors Julia Adams, Jeffrey Alexander, Elijah Anderson, †James Baron, Scott Boorman, Nicholas Christakis, †Paul Cleary, Ron Eyerman, Philip Gorski, Grace Kao, †Peter Salovey, †Vicki Schultz, Philip Smith, †Olav Sorensen

Associate Professors Rene Almeling, Emily Erikson, †Marissa King, †Issa Kohler-Hausmann, Jonathan Wyrzten

Assistant Professors †Justin Farrell, Lloyd Grieger, Alka Menon

†A joint appointment with primary affiliation in another department or school.

Introductory Courses

SOCY 112a / EDST 110a, Foundations in Education Studies Mira Debs

Introduction to key issues and debates in the U.S. public education system. Focus on the nexus of education practice, policy, and research. Social, scientific, economic, and political forces that shape approaches to schooling and education reform. Theoretical and practical perspectives from practitioners, policymakers, and scholars. so

SOCY 126b / HLTH 140b, Health of the Public Nicholas Christakis

Introduction to the field of public health. The social causes and contexts of illness, death, longevity, and health care in the United States today. How social scientists, biologists, epidemiologists, public health experts, and doctors use theory to understand issues and make causal inferences based on observational or experimental data. Biosocial science and techniques of big data as applied to health. so

SOCY 133a, Computers, Networks, and Society Scott Boorman

Comparison of major algorithm-centered approaches to the analysis of complex social network and organizational data. Fundamental principles for developing a disciplined

and coherent perspective on the effects of modern information technology on societies worldwide. Software warfare and algorithm sabotage; blockmodeling and privacy; legal, ethical, and policy issues. No prior experience with computers required. SO RP

SOCY 141b, Sociology of Crime and Deviance Staff

An introduction to sociological approaches to crime and deviance. Review of the patterns of criminal and deviant activity within society; exploration of major theoretical accounts. Topics include drug use, violence, and white-collar crime. SO

SOCY 144a / EDST 144a / ER&M 211a / EVST 144a, Race, Ethnicity, and Immigration

Grace Kao

Exploration of sociological studies and theoretical and empirical analyses of race, ethnicity, and immigration, with focus on race relations and racial and ethnic differences in outcomes in contemporary U.S. society (post-1960s). Study of the patterns of educational and labor market outcomes, incarceration, and family formation of whites, blacks (African Americans), Hispanics, and Asian Americans in the United States, as well as immigration patterns and how they affect race and ethnic relations.

SO

*** SOCY 167a, Social Networks and Society** Staff

Introduction to the theory and practice of social network analysis. The role of social networks in contemporary society; basic properties of network measures, matrices, and statistics. Theoretical concepts such as centrality and power, cohesion and community, structural holes, duality of persons and groups, small worlds, and diffusion and contagion. Use of social structural, dynamic, and statistical approaches, as well as network analysis software. No background in statistics required. SO

Courses in Sociological Theory

Open to all students without prerequisite.

SOCY 151a / PLSC 290a, Foundations of Modern Social Theory Emily Erikson

Major works of social thought from the beginning of the modern era through the 1900s. Attention to social and intellectual concepts, conceptual frameworks and methods, and contributions to contemporary social analysis. Writers include W.E.B. Du Bois, Simone De Beauvoir, Adam Smith, Thomas Hobbes, Jean-Jacques Rousseau, Immanuel Kant, Emile Durkheim, Max Weber, and Karl Marx. SO

*** SOCY 152b, Topics in Contemporary Social Theory** Staff

In-depth introduction to recent developments in social theory, with particular emphasis on the last twenty years. Focus on three distinct areas of study: the building blocks and contrasting understandings of human persons and social action; the competing theories of the social structure of markets, institutions, cultures, social fields, and actor-networks; and the theoretical controversies concerning nations, states and empires, ethnic and racial identity, and the relation between facts and values in social research. Authors include Judith Butler, Michel Foucault, Jurgen Habermas, Pierre Bourdieu and Bruno Latour. None. Though "Foundations of Modern Social Theory" or equivalent is strongly recommended. WR, SO

Courses in Sociological Methods

* **SOCY 160b, Methods of Inquiry** Julia Adams

The theory and practice of social inquiry. How social scientists—and aspiring social scientists—actually do their work, including designing research, sampling and measuring, and interpreting results. Examination of thesis proposal writing; ethical quandaries involved in social research. No background in social research assumed. SO

* **SOCY 162a / EDST 162a, Methods in Quantitative Sociology** Staff

Introduction to methods in quantitative sociological research. Topics include: data description; graphical approaches; elementary probability theory; bivariate and multivariate linear regression; regression diagnostics. Students use Stata for hands-on data analysis. QR, SO

* **SOCY 167a, Social Networks and Society** Staff

Introduction to the theory and practice of social network analysis. The role of social networks in contemporary society; basic properties of network measures, matrices, and statistics. Theoretical concepts such as centrality and power, cohesion and community, structural holes, duality of persons and groups, small worlds, and diffusion and contagion. Use of social structural, dynamic, and statistical approaches, as well as network analysis software. No background in statistics required. SO

Intermediate Courses

The prerequisite for intermediate courses is one introductory Sociology course or permission of the instructor.

SOCY 170b / AFAM 186b / LAST 214b / PLSC 378b, Contesting Injustice Elisabeth Wood

Exploration of why, when, and how people organize collectively to challenge political, social, and economic injustice. Cross-national comparison of the extent, causes, and consequences of inequality. Analysis of mobilizations for social justice in both U.S. and international settings. Intended primarily for freshmen and sophomores. SO

* **SOCY 172b / EP&E 241 / PLSC 415b, Religion and Politics in the World** Katharine Baldwin

A broad overview of the relationship between religion and politics around the world, especially Christianity and Islam. Religions are considered to constitute not just theologies but also sets of institutions, networks, interests, and sub-cultures. The course's principal aim is to understand how religion affects politics as an empirical matter, rather than to explore moral dimensions of this relationship. SO

* **SOCY 202b, Cultural Sociology** Jeffrey Alexander

Study of "irrational" meanings in supposedly rational, modern societies. Social meanings are symbolic, sensual, emotional, and moral. They affect every dimension of social life, from politics and markets to race and gender relations, class conflict, and war. Examination of century old counter-intuitive writings of Durkheim and Weber, breakthroughs of semiotics and anthropology in mid-century, creation of modern cultural sociology in the 1980s, and new thinking about social performance and material icons today. Topics include: ancient and modern religion, contemporary capitalism, professional wrestling, the Iraq War, impeachment of Bill Clinton, Barack Obama's first presidential campaign, and the new cult of vinyl records. SO

SOCY 223a / ER&M 206a / PLSC 437a, The Politics of Ethnic and National Identity

Maria Jose Hierro

Introduction to the study of ethnic and national identity, their determinants and consequences in comparative perspective. SO

* **SOCY 238b / PLSC 276b, Wrongful Convictions in Law and Politics** Nilakshi Parndigamage

This course will examine the problem of wrongful convictions and the various political and social factors that result in innocent people being convicted of serious crimes. Topics include eye-witness misidentifications, unreliable forensic science, false confessions, jailhouse informants, prosecutorial and law enforcement misconduct, race and gender, criminal justice reform, and varied approaches to wrongful convictions across the world. SO

Advanced Courses

Courses in this category are open to students who have completed one intermediate course and any other specified requirement, or by permission of the instructor. Preference is given to Sociology majors in their junior and senior years.

* **SOCY 307b / ER&M 376b / MGRK 304b / PLSC 376b, Extreme and Radical Right Movements** Paris Aslanidis

Extreme and radical right movements and political parties are a recurrent phenomenon found in most parts of the world. Discussion of their foundational values and the causes of their continuous, even increasing, support among citizens and voters. SO

* **SOCY 319a / AFAM 390a / ER&M 419a, Ethnography of the African American Community** Elijah Anderson

An ethnographic study of the African American community. Analysis of ethnographic and historical literature, with attention to substantive, conceptual, and methodological issues. Topics include the significance of slavery, the racial ghetto, structural poverty, the middle class, the color line, racial etiquette, and social identity. SO

* **SOCY 352b / HUMS 247b, Material Culture and Iconic Consciousness** Jeffrey Alexander

How and why contemporary societies continue to symbolize sacred and profane meanings, investing these meanings with materiality and shaping them aesthetically. Exploration of "iconic consciousness" in theoretical terms (philosophy, sociology, semiotics) and further exploration of compelling empirical studies about food and bodies, nature, fashion, celebrities, popular culture, art, architecture, branding, and politics. HU, SO

* **SOCY 365a / PLSC 241a, The Making of Political News** Matthew Mahler

The processes through which political news gets made. How the form and content of political news are shaped in and through the ongoing relationships between political operatives and journalists; ways in which these actors attempt to structure and restructure such relationships to their benefit. SO

Individual Study and Research Courses

*** SOCY 471a and SOCY 472b, Individual Study** Staff

Individual study for qualified juniors and seniors under faculty supervision. To register for this course, each student must submit to the director of undergraduate studies a written plan of study that has been approved by a faculty adviser.

*** SOCY 491a and SOCY 492b, Senior Essay and Colloquium for Nonintensive Majors**

Jonathan Wyrzten

Independent library-based research under faculty supervision. To register for this course, students must submit a written plan of study approved by a faculty adviser to the director of undergraduate studies no later than the end of registration period in the term in which the senior essay is to be written. The course meets biweekly, beginning in the first week of the term.

*** SOCY 493a and SOCY 494b, Senior Essay and Colloquium for Intensive Majors**

Jonathan Wyrzten

Independent research under faculty direction, involving empirical research and resulting in a substantial paper. Workshop meets biweekly to discuss various stages of the research process and to share experiences in gathering and analyzing data.

*** SOCY 494b, Senior Essay and Colloquium for Intensive Majors** Jonathan Wyrzten

Independent research under faculty direction, involving empirical research and resulting in a substantial paper. Workshop meets biweekly to discuss various stages of the research process and to share experiences in gathering and analyzing data. The first meeting is in the second week of the term.

South Asian Studies

Director of undergraduate studies: Harry Blair (harry.blair@yale.edu), Rm. 210, 34 Hillhouse Ave., 432-5687; southasia.macmillan.yale.edu

The program in South Asian Studies combines the requirements of a discipline-based first major with significant course work in South Asian Studies. South Asian Studies can be taken only as a second major. The major is intended to provide students with a broad understanding of the history, culture, and languages of South Asia, as well as the region's current social, political, and economic conditions. Work in a discipline-based major coupled with a focus on South Asia prepares students for graduate study, employment in nongovernmental organizations, or business and professional careers in which an understanding of the region is essential.

REQUIREMENTS OF THE MAJOR

In addition to fulfilling the requirements of the primary major, a student choosing South Asian Studies as a second major must complete seven term courses in South Asian Studies numbered 200 or above. At least two of the seven courses must address premodern South Asia, and at least two should be seminars. Students may petition the director of undergraduate studies (DUS) to include one relevant course from another department or program; approval may require additional course work on South Asian topics. Students must also complete the senior requirement and meet the major's language requirement.

Language requirement One South Asian language must be studied at the advanced level (L5). Students who matriculate with advanced proficiency in a South Asian language (excluding English), as demonstrated through testing, are encouraged to study Sanskrit, or to study a second modern language through Yale courses or the Directed Independent Language Study program. Students may request substitution of another appropriate language (e.g., Persian or Arabic) for the core language requirement, and they are encouraged to pursue intensive language study through courses or work abroad.

Credit/D/Fail A maximum of one course taken Credit/D/Fail may count toward the major.

SENIOR REQUIREMENT

The senior requirement may be fulfilled by completion of a seminar that culminates in a senior essay. Alternatively, the requirement may be fulfilled by completion of a one-credit, two-term senior research project in SAST 491, 492, or by completion of a one-credit, one-term directed study in SAST 486 that culminates in a senior essay. The senior essay should be a substantial paper with a maximum length of 8,000 words for one term, and 10,500 words for two terms. The use of primary materials in the languages of the region is encouraged in senior essay projects. The DUS must approve senior essay plans early in the student's senior year.

ADVISING

The South Asian Studies major permits students to choose courses from a wide range of disciplines. Individual programs should have a balance between courses in the humanities and those in the social sciences. The proposed course of study must be

approved each term by the DUS. Students should also identify an adviser from the South Asian Studies faculty in their area of specialization as early as possible.

Two majors Permission to complete two majors must be secured from the Committee on Honors and Academic Standing. Application forms are available from the residential college deans and must be submitted prior to the student's final term.

Courses in the Graduate School Graduate courses in South Asian Studies are open to qualified undergraduates. Course descriptions appear in the online Graduate School bulletin and are also available in the South Asian Studies program office. Permission of the instructor and of the director of graduate studies is required.

STUDY ABROAD

Up to three course credits from approved study abroad programs may be applied toward the requirements of the major, with permission of the DUS.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 7 term courses (not incl senior req or lang req)

Distribution of courses 7 courses in South Asian Studies numbered 200 or above, 2 in premodern, 2 sems

Substitution permitted One relevant course in another dept, and/or up to 3 study abroad credits with DUS permission

Language requirement Study in a South Asian lang through L5 level

Senior requirement Senior essay in sem, or research project in SAST 491, 492, or senior essay in SAST 486

FACULTY ASSOCIATED WITH THE PROGRAM OF SOUTH ASIAN STUDIES

Professors Akhil Amar (*Law School*), Tim Barringer (*History of Art*), Veneeta Dayal (*Linguistics*), Nihal de Lanerolle (*School of Medicine*), Michael Dove (*Anthropology, Forestry & Environmental Studies*), Phyllis Granoff (*Religious Studies*), Robert Jensen (*Economics*), Mushfiq Mobarak (*Economics, School of Management*), Kaiyan Munshi (*Economics*), Rohini Pande (*Economics*), Kalyanakrishnan Sivaramakrishnan (*Anthropology, Forestry & Environmental Studies*), Shyam Sunder (*School of Management*), Steven Wilkinson (*Political Science*)

Associate Professors Rohit De (*History*), Mayur Desai (*Public Health*), Zareena Grewal (*Ethnicity, Race, & Migration*), Kishwar Rizvi (*History of Art*)

Assistant Professors Subhashini Kaligotla (*History of Art*), Sarah Khan (*Political Science*), Priyasha Mukhopadhyay (*English*)

Senior Lecturer Carol Carpenter (*Anthropology, Forestry & Environmental Studies*)

Lecturers Hugh Flick, Jr. (*Religious Studies*), Supriya Gandhi (*Religious Studies*)

Senior Lectors Seema Khurana, Swapna Sharma

Lector Aleksandar Uskokov

Language and Literature Courses

* HNDI 110a, Elementary Hindi I Staff

An in-depth introduction to modern Hindi, including the Devanagari script. A combination of graded texts, written assignments, audiovisual material, and computer-based exercises provides cultural insights and increases proficiency in understanding, speaking, reading, and writing Hindi. Emphasis on spontaneous self-expression in the language. No prior background in Hindi assumed. L1 1½ Course cr

HNDI 120b, Elementary Hindi II Staff

Continuation of HNDI 110. After HNDI 110 or equivalent. L2 1½ Course cr

HNDI 130a, Intermediate Hindi I Swapna Sharma and Seema Khurana

The first half of a two-term sequence designed to develop proficiency in the four language skills. Extensive use of cultural documents including feature films, radio broadcasts, and literary and nonliterary texts to increase proficiency in understanding, speaking, reading, and writing Hindi. Focus on cultural nuances and Hindi literary traditions. Emphasis on spontaneous self-expression in the language. After HNDI 120 or equivalent. L3 1½ Course cr

* HNDI 132a, Accelerated Hindi I Swapna Sharma

A fast-paced course designed for students who are able to understand basic conversational Hindi but who have minimal or no literacy skills. Introduction to the Devanagari script; development of listening and speaking skills; vocabulary enrichment; attention to sociocultural rules that affect language use. Students learn to read simple texts and to converse on a variety of everyday personal and social topics.

L3

HNDI 140b, Intermediate Hindi II Seema Khurana and Swapna Sharma

Continuation of HNDI 130. After HNDI 130 or equivalent. L4 1½ Course cr

* HNDI 142b, Accelerated Hindi II Swapna Sharma

Continuation of HNDI 132. Development of increased proficiency in the four language skills. Focus on reading and higher language functions such as narration, description, and comparison. Reading strategies for parsing paragraph-length sentences in Hindi newspapers. Discussion of political, social, and cultural dimensions of Hindi culture as well as contemporary global issues. L4

HNDI 150a, Advanced Hindi Seema Khurana

An advanced language course aimed at enabling students to engage in fluent discourse in Hindi and to achieve a comprehensive knowledge of formal grammar. Introduction to a variety of styles and levels of discourse and usage. Emphasis on the written language, with readings on general topics from newspapers, books, and magazines. Prerequisite: HNDI 140 or permission of instructor. L5

* HNDI 160a, Modern Hindi Literature Swapna Sharma

An advanced language course designed to develop overall language skills and to enrich cultural insight through the literature of different genres. Literature is the cultural canvas of a society. Reading modern Hindi literature and translations of vernacular literature from various states in India enhance the understanding of Indian culture and society. Prerequisite: HNDI 150 or instructor permission. L5

*** HNDI 198a or b, Advanced Tutorial** Staff

For students with advanced Hindi language skills who wish to engage in concentrated reading and research on material not otherwise offered by the department. Work must be supervised by an adviser and must terminate in a term paper or the equivalent. Permission to enroll requires submission of a detailed project proposal and its approval by the language studies coordinator. Prerequisite: HNDI 150 or equivalent.

*** PNJB 130a, Intermediate Punjabi I** Staff

The important target of this course is to develop basic Punjabi Language skills (reading, writing, listening and speaking). This is approached through the theme-based syllabus, discussion in small groups and paired activities on the cultural background of Punjab or Punjabi culture. As well as, the listening and speaking skills would be developed by using the media such as educational material, Punjabi movies, music and computer lab sessions. The usage of the textbooks would lead us to learn grammatical rules of the Punjabi language. The students are approached individually, since the class typically consists of students in the various backgrounds. Prerequisite: PNJB 120 or equivalent. Course taught through distance learning using videoconferencing technology from Columbia University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L3
RP 1½ Course cr

*** SKRT 110a / LING 115a, Introductory Sanskrit I** Aleksandar Uskokov

An introduction to Sanskrit language and grammar. Focus on learning to read and translate basic Sanskrit sentences in Devanagari script. No prior background in Sanskrit assumed. L1 1½ Course cr

SKRT 120b / LING 125b, Introductory Sanskrit II Aleksandar Uskokov

Continuation of SKRT 110. Focus on the basics of Sanskrit grammar; readings from classical Sanskrit texts written in Devanagari script. After SKRT 110. L2 1½ Course cr

SKRT 130a / LING 138a, Intermediate Sanskrit I Aleksandar Uskokov

The first half of a two-term sequence aimed at helping students develop the skills necessary to read texts written in Sanskrit. Readings include selections from the *Hitopadesa*, *Kathasaritsagara*, *Mahabharata*, and *Bhagavadgita*. After SKRT 120 or equivalent. L3

SKRT 140b / LING 148b, Intermediate Sanskrit II Aleksandar Uskokov

Continuation of SKRT 130, focusing on Sanskrit literature from the *kavya* genre. Readings include selections from the *Jatakamala* of Aryasura and the opening verses of Kalidasa's *Kumarasambhava*. After SKRT 130 or equivalent. L4

*** SKRT 150b, Advanced Sanskrit: Readings in Indian Philosophy and Aesthetics**
Aleksandar Uskokov

This advanced language course introduces the jargon of the philosophical disciplines (theory of knowledge, metaphysics, philosophy of mind and language, philosophical theology, hermeneutics) and aesthetics in the several systems of learning in ancient and classical India, across the traditions of Hinduism, Buddhism, and Jainism. Additionally, the course introduces topics of philosophical significance in foundational texts such as the Upanishads, portions of the *Mahābhārata* and the *Purāṇas*, and the Buddhist *sūtra* literature. Special attention is given to matters of style, scholastic techniques, and advanced morphology and syntax. The course, thus, combines advanced language instruction with learning intellectual and cultural content, and it facilitates training in

primary research in one of the classical languages of South Asia. Prerequisite: SKRT 140 or equivalent, or instructor permission. L5

*** SNHL 110a, Elementary Sinhala I** Staff

First half of a two-term sequence focusing on all four language skills. Basic grammar, sentence construction, simple reading materials, and use of everyday expressions. Course taught through distance learning using videoconferencing technology from Cornell University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L1 RP 1½ Course cr

*** SNHL 130a, Intermediate Sinhala I** Staff

Further development of speaking, listening, reading, and writing skills in Sinhala. Communicative approach to the exchange of ideas and information, with early emphasis on oral skills and reading comprehension. Prerequisite: SNHL 120 or equivalent. Course taught through distance learning using videoconferencing technology from Columbia University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L3 RP 1½ Course cr

*** TAML 130a, Intermediate Tamil I** Staff

The first half of a two-term sequence designed to develop proficiency in comprehension, speaking, reading, and writing through the use of visual media, newspapers and magazines, modern fiction and poetry, and public communications such as pamphlets, advertisements, and government announcements. Prerequisite: TAML 120 or equivalent. Course taught through distance learning using videoconferencing technology from Columbia University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L3 RP 1½ Course cr

*** TBTN 110a, Elementary Classical Tibetan I** Staff

First half of a two-term introduction to classical Tibetan. The script and its Romanization, pronunciation, normative dictionary order, and basic grammar. Readings from Tibetan literature and philosophy. Course taught through distance learning using videoconferencing technology from Columbia University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L1

*** TBTN 130a, Intermediate Classical Tibetan I** Staff

Continuation of TBTN 120. Introduction to more complex grammatical constructions. Further development of reading ability in various genres of Tibetan literature written prior to 1959. Prerequisite: TBTN 120 or equivalent. Course taught through distance learning using videoconferencing technology from Columbia University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L3 RP 1½ Course cr

General Courses in South Asian Studies

*** SAST 057a / RLST 015a, Gods and Heroes in Indian Religions** Phyllis Granoff

The basic doctrines and practices of India's three classical religions, Buddhism, Jainism, and Hinduism, explored through close reading of texts in translation. Lives of the founders, great monks, nuns, and lay followers of Buddhism and Jainism; myths of the major Hindu gods; heroines and goddesses in the three traditions. Enrollment limited

to first-year students. Preregistration required; see under First-Year Seminar Program.

HU

*** SAST 058a / RLST 018a, Yoga in South Asia and Beyond** Supriya Gandhi

The history of yoga practice and thought from the earliest textual discussions of yoga until the present day. Topics include the body, cosmology, cross-cultural interactions, colonialism, and orientalism. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU

*** SAST 059a / ENGL 025a / LITR 023a, Modern South Asian Literature, 1857–2017**

Priyasha Mukhopadhyay

Exploration of literary texts from South Asia, 1857 to the present. Close reading of literary texts from India, Pakistan, Bangladesh, and Sri Lanka, alongside political speeches, autobiographies, and oral narratives. Topics include colonialism, history writing, migration, language, caste, gender and desire, translation, politics and the novel. Enrollment limited to first-year students. Preregistration is required; see under First-Year Seminar Program. WR, HU

*** SAST 060a / HSAR 015a, Ten Indian Objects** Subhashini Kaligotla

A 5000-year-old stone seal, a 20th century comic book, an emperor's painted portrait, a processional bronze god, a miniature temple, an inscribed pillar, a rock crystal reliquary, a serene Buddha, an animated film, and a towering female figure. Through rigorous explorations of these ten objects from South Asia this seminar teaches close looking, vivid writing, and narrating history through things. It considers both the biographies of the objects and their involvement in the wider social, political, artistic, and cultural histories of the Indian subcontinent. Students engage some of the most exciting scholarship in the field of South Asian art, and observe, draw, and write about things in museums and art collections on a weekly basis. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. HU

SAST 219b / ANTH 276b, South Asian Social Worlds Staff

Study of a series of texts that introduce anthropological and critical approaches to South Asia's peoples and cultures while questioning the historical and political possibility of understanding such a diverse region. WR, SO

SAST 260a / HSAR 143a / RLST 188a, Introduction to the History of Art: Buddhist Art and Architecture, 900 to 1600 Mimi Yiengpruksawan

Buddhist art and architecture of East Asia, Southeast Asia, and Tibet from the tenth century to the early modern period. Emphasis on cross-regional engagements including the impact of Islam. HU

SAST 281b / ECON 325b / EP&E 321b, Economics of Developing Countries: Focus on South Asia Zachary Barnett-Howell

Analysis of current problems of developing countries. Emphasis on the role of economic theory in informing public policies to achieve improvements in poverty and inequality, and on empirical analysis to understand markets and responses to poverty. Topics include microfinance, education, health, agriculture, intrahousehold allocations, gender, and corruption. Prerequisites: introductory microeconomics and introductory econometrics. SO

*** SAST 306a / ANTH 322a / EVST 324a, Environmental Justice in South Asia** Staff

Study of South Asia's nation building and economic development in the aftermath of war and decolonization in the 20th century. How it generated unprecedented stress

on natural environments; increased social disparity; and exposure of the poor and minorities to environmental risks and loss of homes, livelihoods, and cultural resources. Discussion of the rise of environmental justice movements and policies in the region as the world comes to grips with living in the Anthropocene. SO

* **SAST 323a / HIST 313Ja, British Raj and the Indian Nation (1757-1947)** Rohit De
Drawing on a wide genre of primary sources, this seminar explores the consolidation of British rule over the Indian subcontinent; the transformations brought about by colonial policies; the subsequent rise of resistance movements; the growth of mass nationalism and partition and independence. WR, HU

* **SAST 362a / RLST 321a, Hindus and Muslims in South Asia** Supriya Gandhi
Study of engagements between Hindu and Muslim traditions in South Asia from medieval to modern times. Exploration of historical case studies of Hindu-Muslim relations and the formation of religious identities, as well as how memories of the past intersect with modern discourses on religion and politics. HU

* **SAST 486a, Directed Study** Staff

A one-credit, single-term course on topics not covered in regular offerings. To apply for admission, a student should present a course description and syllabus to the director of undergraduate studies, along with written approval from the faculty member who will direct the study.

Senior Essay Courses

* **SAST 491a and SAST 492b, Senior Essay** Staff

A yearlong research project completed under faculty supervision and resulting in a substantial paper. Credit for SAST 491 only on completion of SAST 492. ½ Course cr per term

Southeast Asia Studies

Chair: Michael R. Dove (michael.dove@yale.edu), Kroon 134, 432-3463; assistant director: Kristine Mooseker (kristine.mooseker@yale.edu), 311 LUCE, 432-3431; cseas.yale.edu/

The Council on Southeast Asia Studies offers an interdisciplinary program that brings together faculty and students sharing an interest in Southeast Asia and contributes to the curriculum with language courses, a weekly seminar series, periodic conferences, cultural events, and special lectures. Yale maintains extensive library and research collections on Southeast Asia, including online archives of periodicals and newspapers from all parts of the region.

Yale does not offer a degree in Southeast Asia studies, but majors in any department may consult with Council faculty regarding a senior essay on a Southeast Asian topic, and in certain circumstances students who have a special interest in the region may consider a Special Divisional Major. Students interested in pursuing field research or language study in Southeast Asia may apply to the Council for summer fellowship support.

Courses featuring Southeast Asian content are offered each year within a variety of departments, including Anthropology, Environmental Studies, History, History of Art, Music, Philosophy, Political Science, and at the School of Forestry and Environmental Studies. A list of courses for the current year can be obtained through the Council office or the Southeast Asia Studies website.

Language instruction at all levels is offered in two Southeast Asian languages, Indonesian and Vietnamese. Other Southeast Asian languages may be available in any given year via video conference through the Yale Shared Course Initiative. Check the Southeast Asia Studies language studies page for updated information. The Council on Southeast Asia Studies supports language tables and independent study in other Southeast Asian languages through the Directed Independent Language Study program.

FACULTY ASSOCIATED WITH THE COUNCIL ON SOUTHEAST ASIA STUDIES

Professors Michael R. Dove (*Forestry & Environmental Studies*), J. Joseph Errington (*Anthropology*), Benedict Kiernan (*History*), James Scott (*Political Science*), Mimi Yiengpruksawan (*History of Art*)

Associate Professor Erik Harms (*Anthropology*)

Senior Lecturers Carol Carpenter (*Forestry & Environmental Studies, Anthropology*), Amity Doolittle (*Forestry & Environmental Studies*)

Lecturer Quan T. Tran (*American Studies*)

Curator Ruth Barnes (*Art Gallery*)

Senior Lector II Quang Phu Van (*Vietnamese*)

Senior Lectors Dinny Risri Aletheiana (*Indonesian*), Indriyo Sukmono (*Indonesian*)

Burmese Courses

BURM 110a, Elementary Burmese I Staff

This course aims to train students to achieve basic skills in Burmese. The students develop competency in reading and writing Burmese script and also learn basic spoken Burmese. This course is taught through distance learning from Cornell University using videoconferencing technology. Interested students may e-mail minjin.hashbat@yale.edu for information. L1 RP 1½ Course cr

BURM 120b, Elementary Burmese II Staff

This course aims to give the students a confident and enjoyable start in speaking Burmese, focusing on what they are most likely to need when visiting the country. It covers the basics of pronunciation and grammar. Prerequisite: BURM 110 or equivalent. This course is taught through distance learning from Cornell University using videoconferencing technology. Interested students may e-mail minjin.hashbat@yale.edu for information. L2 RP 1½ Course cr

Indonesian Courses

* **INDN 110a, Elementary Indonesian I** Indriyo Sukmono

An introductory course in standard Indonesian with emphasis on developing communicative skills through a systematic survey of grammar and graded exercises. Enrollment limited to 15 per section. L1 1½ Course cr

* **INDN 120b, Elementary Indonesian II** Indriyo Sukmono

Continuation of INDN 110. Introduction to reading, leading to mastery of language patterns, essential vocabulary, and basic cultural competence. After INDN 110 or equivalent. Enrollment limited to 15 per section. L2 1½ Course cr

* **INDN 130a, Intermediate Indonesian I** Dinny Risri Aletheiani

Continued practice in colloquial Indonesian conversation and reading and discussion of texts. After INDN 120 or equivalent. Limited enrollment. L3 1½ Course cr

* **INDN 140b, Intermediate Indonesian II** Dinny Risri Aletheiani

Continuation of INDN 130. After INDN 130 or equivalent. Limited enrollment. L4 1½ Course cr

* **INDN 150a, Advanced Indonesian I** Indriyo Sukmono

Development of advanced fluency through discussion of original Indonesian sociohistorical, political, and literary texts and audiovisual sources. Extension of cultural understanding of Indonesia. Prerequisite: INDN 140 or equivalent. May not be taken after INDN 153. L5

* **INDN 160b, Advanced Indonesian II** Indriyo Sukmono

Continuation of INDN 150. Prerequisite: INDN 150 or equivalent. L5

* **INDN 170a, Advanced Indonesian: Special Topics** Dinny Risri Aletheiani

Continuation of INDN 160. Students advance their communicative competence in listening, speaking, reading, and writing. Use of Indonesian book chapters, Web pages, printed and electronic articles, social networking posts, newsgroups, and letters. Prerequisite: INDN 160.

* **INDN 180b, Research and Creative Project on Indonesia** Dinny Risri Aletheiani
Continuation of INDN 170. Advancement in students' competence in listening, speaking, reading, and writing. Reading materials include book chapters, Web sites, print and electronic articles, e-mail messages, blogs, and social networking posts. Prerequisite: INDN 170.

* **INDN 470a and INDN 471b, Independent Tutorial** Dinny Risri Aletheiani
For students with advanced Indonesian language skills who wish to engage in concentrated reading and research on material not otherwise offered in courses. The work must be supervised by an adviser and must terminate in a term paper or its equivalent. After INDN 160. Permission to enroll requires submission of a detailed project proposal and its approval by the program adviser.

Khmer Courses

* **KHMR 110a, Elementary Khmer I** Staff
Basic structures of modern standard Cambodian introduced through the integration of communicative practice, reading, writing, and listening comprehension. Introduction to Khmer society and culture. Course taught through distance learning using videoconferencing technology from Cornell University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L1
1½ Course cr

* **KHMR 120b, Elementary Khmer II** Staff
Basic structures of modern standard Cambodian introduced through the integration of communicative practice, reading, writing, and listening comprehension. Introduction to Khmer society and culture. Prerequisite: KHMR 110. Course taught through distance learning using videoconferencing technology from Cornell University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. L2 1½ Course cr

KHMR 130a, Intermediate Khmer I Staff
This course focuses on learning Khmer (the national language of Cambodia). Students communicate in day-to-day conversation using complex questions and answers. The course focuses on reading, writing, speaking, and listening to Khmer words, long sentences, and texts. The course also emphasizes grammar, sentence structure and using words correctly. Course taught through distance learning using videoconferencing technology from Cornell University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. Prerequisite: KHMR 120 or equivalent. L3 RP 1½ Course cr

KHMR 140b, Intermediate Khmer II Staff
This course focuses on learning Khmer (the national language of Cambodia). Students communicate in every day conversation using complex questions/answers. The course focuses on reading, writing, speaking, and listening to Khmer words, long sentences, and texts. The course also emphasizes grammar, sentence structure and using words correctly. Course taught through distance learning using videoconferencing technology from Cornell University. Enrollment limited; interested students should e-mail minjin.hashbat@yale.edu for more information. Prerequisite: KHMR 130 or equivalent. L4 RP 1½ Course cr

Vietnamese Courses

VIET 110a, Elementary Vietnamese I Quang Phu Van

Students acquire basic working ability in Vietnamese, developing skills in speaking, listening, writing (Roman script), and reading. Discussion of aspects of Vietnamese society and culture. Intended for students with no previous knowledge of Vietnamese.

L1 1½ Course cr

VIET 120b, Elementary Vietnamese II Quang Phu Van

Continuation of VIET 110. L2 1½ Course cr

*** VIET 132a, Accelerated Vietnamese** Quang Phu Van

This course follows a community-based language model designed for heritage students or speakers who comprehend and speak informal Vietnamese on topics related to everyday situations but do not read or write Vietnamese. Study of interpersonal, interpretive, and presentational communicative modes, as well as standard foreign language education (communication, cultures, connections, comparisons, and communities). Students will engage with Vietnamese American communities in New Haven and beyond. Admits to VIET 140. L3

*** VIET 142b, Accelerated Vietnamese II** Quang Phu Van

An accelerated course designed for heritage students who wish to build a higher level of proficiency and develop sociocultural competence in speaking, reading, and writing. Topics include health care, rituals, community, linguistic landscape, education, mass communication, literature, history, values, and traditional and pop cultures. VIET 132 or equivalent. L4

VIET 150a, Advanced Vietnamese Quang Phu Van

Students improve their fluency and accuracy in Vietnamese and solidify their reading, writing, speaking, and listening skills. Topics include social, economic, and cultural practices, gender issues, notions of power, and taboo. Prerequisite: VIET 140 or equivalent. L5

*** VIET 470a or b, Independent Tutorial** Quang Phu Van

For students with advanced Vietnamese language skills who wish to engage in concentrated reading and research on material not otherwise offered in courses. The work must be supervised by an adviser and must terminate in a term paper or its equivalent. Permission to enroll requires submission of a detailed project proposal and its approval by the program adviser.

Spanish

Director of undergraduate studies: Noël Valis (noel.valis@yale.edu), Rm. 216, 82–90 Wall St., 432-1155; language program director: Ame Cividanes (ame.cividanes@yale.edu), Rm. 210, 82–90 Wall St., 432-1159; span-port.yale.edu

The Department of Spanish and Portuguese provides instruction in the languages, literatures, and cultures of the Hispanic and Luso-Brazilian worlds. Courses in Portuguese and the requirements of the major are described under Portuguese; the names of faculty teaching Portuguese courses are included in the faculty roster.

The major in Spanish is a liberal arts major that offers a wide range of courses in the language, literatures, and cultures of the twenty Spanish-speaking countries in Europe, Latin America, and the Caribbean. Today, Spanish is the second language of the United States, one of the three most widely spoken languages in the world, and one of the five diplomatic languages of the United Nations. The program in Spanish offers students the opportunity to acquire thorough linguistic proficiency as well as in-depth knowledge of both cultural and literary topics. The major explores literature, history, philosophy, art, and cultural studies, and provides excellent preparation for careers in law, diplomacy, medicine, business, the arts, academics, journalism, and education.

COURSE NUMBERING

Courses numbered SPAN 110–199 include beginning and intermediate language courses designed to help students develop fluency in understanding, speaking, reading, and writing Spanish. Courses numbered SPAN 200–299 seek to provide students with a broad but solid introduction to the fields of Hispanic literatures and cultures while strengthening their linguistic competence. Courses numbered 300–499 allow students to perfect their linguistic and critical skills through study of a specific problem or issue, e.g., a literary genre, a type of literary or cultural representation, or a specific writer or text. Students desiring more information about either language or literature offerings should consult the director of undergraduate studies (DUS).

PREREQUISITE

Prerequisite to the major is SPAN 140, 142, or 145, or the equivalent through advanced placement or study abroad. Equivalent preparation to SPAN 140, 142, or 145 may be demonstrated by the test scores indicated below under "Language Courses and Placement Procedures."

LANGUAGE COURSES AND PLACEMENT PROCEDURES

Students with no previous formal or informal Spanish study ordinarily enroll in SPAN 110. Students who take SPAN 110 are strongly encouraged to continue with 120 in the following term. Students wishing to take intensive beginning Spanish may, with the instructor's permission, enroll in SPAN 125, which covers the same material as SPAN 110 and 120, but in one term. SPAN 132 and 142 are designed for heritage speakers and are available only to them. Admission to SPAN 132 and 142 is based on results of the departmental placement examination; interested students should contact the instructor.

All students, including native speakers, who have previously studied Spanish formally or informally must take the departmental placement examination in order to enroll

in a Spanish course. The only exception to this rule is made for students who have demonstrated advanced ability in the language by (1) receiving a score of 5 on either of the Spanish Advanced Placement tests, (2) receiving a score of 6 or 7 on the Advanced-Level International Baccalaureate examination, or (3) attaining a proficiency level of C1 in the Common European Framework of Reference for Languages. These students may enroll directly in any L5 course.

Information about the departmental placement examination and about preregistration procedures for Spanish L1–L4 language courses is available on the department website.

REQUIREMENTS OF THE MAJOR

The major for the Class of 2022 and subsequent classes A maximum of one course taught in English may be counted toward the major requirements. With DUS approval, students who declared their major under previous requirements may also avail themselves of this change.

Beyond the prerequisite, ten term courses numbered SPAN 200 or higher are required, five of which must be numbered SPAN 300 or higher. SPAN 491, The Senior Essay, counts as one of the ten required courses. A maximum of one course may be numbered SPAN 200–230. First-year seminars taught in Spanish count toward the major in the SPAN 231–299 range.

Intensive major Students in the intensive major fulfill the requirements for the standard major, and take an additional two courses numbered SPAN 300 or higher.

SENIOR REQUIREMENT

Seniors write the senior essay in SPAN 491 in the spring of their senior year under the individual direction of a faculty adviser. Students expecting to complete their degree requirements in December write the senior essay in SPAN 491 in the fall of their senior year. Seniors in SPAN 491 are expected to submit their completed essay to the DUS at 82–90 Wall Street by 4 p.m. on December 6 in the fall term, or by 4 p.m. on April 17 in the spring term. If the essay is submitted late without an excuse from the student's residential college dean, the penalty is one letter grade, though no essay that would otherwise pass will be failed because it is late.

ADVISING

Two majors Students electing Spanish as one of two majors should consult the DUS about a specialized course of study.

Courses in the Graduate School Juniors and seniors majoring in Spanish may, with permission of the instructor and the director of graduate studies, enroll in graduate literature courses in Spanish. A list of pertinent graduate courses is available at the office of the DUS.

STUDY ABROAD

Students at the intermediate level of language study are encouraged to apply to the eight-week summer language courses offered by Yale Summer Session in New Haven and Bilbao, Spain, or in Quito, Ecuador. Advanced students may apply for the five-week Yale Summer Session course offered in Valencia, Spain. More information about these programs is available on the Yale Summer Session website. For information about the Year or Term Abroad program, see Academic Regulations, section K, Special

Arrangements. Students who wish to count courses taken abroad toward the major should consult with the DUS before going abroad.

REQUIREMENTS OF THE MAJOR

Prerequisite 1 from SPAN 140, 142, 145, or equivalent

Number of courses 10 term courses (including senior requirement)

Distribution of courses 10 term courses numbered SPAN 200 or higher, 5 of which are numbered SPAN 300 or higher; max of one course numbered SPAN 200–230; max of one SPAN course taught in English with DUS approval

Senior requirement Senior essay (SPAN 491)

Intensive major 2 addtl courses numbered SPAN 300 or higher, totaling 12 term courses

CERTIFICATE OF ADVANCED LANGUAGE STUDY

The Department of Spanish and Portuguese offers a Certificate of Advanced Language Study in Spanish. A certificate adviser, typically the director of undergraduate studies (DUS), advises students on the certification process and certifies to the University Registrar's Office that students have completed the stated requirements before the end of eight terms of study. The Certificate of Advanced Language Study, once certified, is listed on student transcripts.

REQUIREMENTS

Students seeking to earn the certificate are required to take four courses, all beyond the L4 level in their chosen language, at least two of which must be Yale courses designated as L5, and at least one of which must be a Yale 300-level course advanced undergraduate lecture or seminar. All Yale Spanish courses at the 200- or 300-level, which carry an L5 designation, count toward the requirement. First-year seminars taught in Spanish count as courses in the SPAN 231–299 range. All courses must be taken for a letter grade, and students must achieve a grade of B or above. With the approval of the certificate adviser, one advanced non-L5 course conducted in the target language, such as an independent study course, a graduate seminar, or an advanced seminar may count toward certification requirements.

The certificate adviser may approve the substitution of one credit earned as part of a Yale or Yale-designated study abroad program and taught in the target language to count toward the certificate requirements. If the adviser approves courses taken outside of Yale for inclusion in the certificate requirements, students must take the necessary steps to ensure those courses appear on their transcript.

Credit/D/Fail No courses taken Credit/D/Fail may be counted toward the requirements of the certificate.

FACULTY OF THE DEPARTMENT OF SPANISH AND PORTUGUESE

Professors Rolena Adorno, Howard Bloch (*Chair*), Roberto González Echevarría, Aníbal González, K. David Jackson, Noël Valis, Jesús R. Velasco

Associate Professor Leslie Harkema

Senior Lectors II Sybil Alexandrov, Margherita Tortora, Sonia Valle

Senior Lectors I María Pilar Asensio-Manrique, Mercedes Carreras, Ame Cividanes, Sebastián Díaz, María de la Paz García, María Jordán, Rosamaría León, Juliana Ramos-Ruano, Lissette Reymundi, Lourdes Sabé-Colom, Virginia Santos, Terry Seymour

Lectors Carolina Baffi, Deborah K. Symons Roldán, Giseli Tordin, María M. Vázquez

Courses

* **SPAN 060a, First-Year Colloquium: Literary Studies in Spanish** Leslie Harkema
Introduction to the study of literature in general and to some of the most important texts in Hispanic literature. Selected texts in Spanish include short stories, essays, lyric, and theater. Open to students who have placed into L5 courses. Counts toward the requirements of the Spanish major with permission of the director of undergraduate studies. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. L5, HU

* **SPAN 100b, Spanish for Reading** Staff
Overview of fundamental grammar structures and basic vocabulary through comprehensive reading and translation of texts in various fields (primarily humanities and social sciences, and others as determined by student interest). No previous knowledge of Spanish needed. Conducted in English. No preregistration required. Does not satisfy the Yale College language requirement.

* **SPAN 110a or b, Elementary Spanish I** Staff
For students who wish to begin study of the Spanish language. Development of basic skills in understanding, speaking, reading, and writing through a functional approach to the teaching of Spanish grammar. Includes an introduction to the cultures (traditions, art, literature, music) of the Spanish-speaking world. Audiovisual materials are incorporated into class sessions. Conducted in Spanish. To be followed immediately by SPAN 120. L1 RP 1½ Course cr

SPAN 120a or b, Elementary Spanish II Staff
Further development of understanding, speaking, reading, and writing skills. Class sessions incorporate short authentic texts in Spanish, audiovisual materials, and film. Cultural topics of the Spanish-speaking world (traditions, art, literature, music) are included. Conducted in Spanish. After SPAN 110 or in accordance with placement results. Admits to SPAN 130 or 145. L2 RP 1½ Course cr

* **SPAN 125a, Intensive Elementary Spanish** Maria-Lourdes Sabé Colom
An intensive beginning course in spoken and written Spanish that covers the material of SPAN 110 and 120 in one term. Conducted in Spanish. Admits to SPAN 130 or 145. Not open to students who have completed SPAN 110 or 120. L1, L2 RP 2 Course cr

SPAN 130a or b, Intermediate Spanish I Staff
8-week program: based on the Yale campus (New Haven, CT) for 4-weeks followed by 4-weeks in Bilbao, Spain. First course in an intensive "at-home-and-abroad" program. Students development of proficiency in listening, speaking, reading, and writing through communicative activities rather than as a sequence of linguistic units. Use of authentic Spanish language texts, films, and videos; presentation of cultural topics. Prerequisite: SPAN 120 (Elementary Spanish II) or equivalent proficiency. Must be taken in conjunction with SPAN S140 & SPAN S148. Enrollment limited. **Application deadline: February 15.** Students are responsible for arranging travel to and from Bilbao and all other program expenses beyond tuition. For further details, such as program

costs, prerequisites, exact dates, credits, etc., visit the <http://studyabroad.yale.edu/programs/intermediate-spanish-i-ii-culture-1> on the Yale Study Abroad website. L3
RP 1½ Course cr

*** SPAN 132a, Spanish for Heritage Speakers I** Sybil Alexandrov

A language course designed for students who have been exposed to Spanish—either at home or by living in a Spanish-speaking country—but who have little or no formal training in the language. Practice in all four communicative skills (comprehension, speaking, reading, writing), with special attention to basic grammar concepts, vocabulary building, and issues particular to heritage speakers. Admission in accordance with placement results. L3

SPAN 140a or b, Intermediate Spanish II Staff

Continuation of SPAN 130. Development of increased proficiency in the four language skills. Greater precision in grammar usage, vocabulary enrichment, and expanded cultural awareness are achieved through communicative activities based on authentic Spanish-language texts, including a short novel. Conducted in Spanish. Admits to L5 courses. L4 RP 1½ Course cr

*** SPAN 142b, Spanish for Heritage Speakers II** Staff

Continuation of SPAN 132. Examination of complex grammar structures; consideration of problems particular to heritage speakers through the reading of both literary and journalistic texts. Practice in all communicative skills (comprehension, speaking, reading, writing). After SPAN 132 or in accordance with placement results. L4

*** SPAN 145b, Intensive Intermediate Spanish** Staff

An intensive intermediate course in spoken and written Spanish that covers the material of SPAN 130 and 140 in one term. Conducted in Spanish. Admits to L5 courses. Not open to students who have completed SPAN 130 or 140. L3, L4 RP 2 Course cr

SPAN 150a or b, Advanced Oral and Written Communication in Spanish Staff

Instruction in refining reading, writing, aural, and oral skills. Students reach proficiency at the advanced high level (according to ACTFL guidelines) in the four language skills of listening, speaking, reading, and writing. Conducted in Spanish. Open to heritage speakers placed at the L5 level. Prerequisite: SPAN 140 or 145, or in accordance with placement results. L5 RP

*** SPAN 222a / LAST 222a, Legal Spanish** Mercedes Carreras

An introduction to Spanish and Latin American legal culture with a focus on the specific traits of legal language and on the development of advanced language competence. Issues such as human rights, the death penalty, the jury, contracts, statutory instruments, and rulings by the constitutional courts are explored through law journal articles, newspapers, the media, and mock trials. Enrollment limited to 18. A maximum of one course in the 200–230 range may count as an elective toward the Spanish major. L5

*** SPAN 223a or b / LAST 223a or b, Spanish in Film: An Introduction to the New Latin American Cinema** Staff

Development of proficiency in Spanish through analysis of critically acclaimed Latin American films. Includes basic vocabulary of film criticism in Spanish as well as discussion and language exercises. Enrollment limited to 18. L5

*** SPAN 225b / LAST 225b, Spanish for the Medical Professions** Staff

Topics in health and welfare. Conversation, reading, and writing about medical issues for advanced Spanish-language students, including those considering careers in medical professions. Enrollment limited to 18. L5

*** SPAN 227a / LAST 227a, Creative Writing** María Jordán

An introduction to the craft and practice of creative writing (fiction, poetry, and essays). Focus on the development of writing skills and awareness of a variety of genres and techniques through reading of exemplary works and critical assessment of student work. Emphasis on the ability to write about abstract ideas, sentiments, dreams, and the imaginary world. Enrollment limited to 18. A maximum of one course in the 200-230 range may count as an elective toward the Spanish major. L5

*** SPAN 243a or b / LAST 243a or b, Advanced Spanish Grammar** Staff

A comprehensive, in-depth study of grammar intended to improve students' spoken and written command of Spanish. Linguistic analysis of literary selections; some English-to-Spanish translation. Enrollment limited to 18. L5

SPAN 246b, Introduction to the Cultures of Spain Leslie Harkema

Study of various aspects of Spanish culture, including its continuing relation to the societies of Latin America. Examination of Spanish politics, history, religions, art forms, music, and literatures, from ancient times to the present. Primary sources and critical studies are read in the original. L5, HU

SPAN 247a / LAST 247a, Introduction to the Cultures of Latin America Rolena Adorno

A chronological study of Latin American cultures through their expressions in literature and the arts, beginning in the pre-Columbian period and focusing on the period from the nineteenth century to the present. Emphasis on crucial historical moments and on distinctive rituals such as fiestas. Open to students who have placed into L5 courses or who have successfully completed an L4 course in Spanish. Counts toward the major in Spanish. L5, HU

SPAN 261a / LAST 261a, Studies in Spanish Literature I Staff

An introduction to Spanish prose, drama, and lyric poetry from their medieval multicultural origins through the Golden Age in the seventeenth century. Readings include *El Cid*, *La Celestina*, *Conde Lucanor*, and works by Miguel de Cervantes and Calderón de la Barca. Open to students who have placed into L5 courses or who have successfully completed an L4 course in Spanish. Counts toward the major in Spanish. L5, HU

*** SPAN 262b / LAST 262b, Studies in Spanish Literature II** Noël Valis

An introduction to Spanish prose, drama, and lyric poetry from the eighteenth century to the present, centered on the conflict between modernity and tradition and on the quest for national identity. Texts by Gustavo Adolfo Bécquer, Emilia Pardo Bazán, Antonio Machado, Federico García Lorca, Ramón Sender, and Ana María Matute, among others. Open to students who have placed into L5 courses or who have successfully completed an L4 course in Spanish. L5, HU

SPAN 302b / LITR 445b, El Quijote en español Roberto González Echevarría

A detailed and contextualized reading of Cervantes's masterpiece conducted entirely in Spanish. The study of this iconic text familiarizes students with its literary and cultural

values and Cervantes' language. Prerequisites: SPAN 140, 142, 145, or equivalent. L5, HU

* **SPAN 329b / LITR 459b, Golden Age Theater** Roberto González Echevarría
The development and apogee of the Spanish *comedia*, as well as contemporary minor subgenres such as the *auto sacramental* and the *entremés*. Exploration of how the theater synthesizes post-Garcilaso lyric, the *commedia dell'arte*, renaissance epic, the *romancero*, Spanish history, and the European renaissance literary tradition. Works by Cervantes, Lope de Vega, Tirso de Molina, Guillén de Castro, Mira de Amescua, Juan Ruiz de Alarcón, Luis Quiñones de Benavente, Pedro Calderón de la Barca, and Sor Juana Inés de la Cruz. Comparison with English and French theater is encouraged. SPAN 140, 142, 145, or equivalent. L5, HU

* **SPAN 334a, Migration and Multiculturalism in Contemporary Spanish Literature and Film** Leslie Harkema

Overview and discussion of literary and cinematic reflections on immigration in Spain since the end of the Franco dictatorship and especially over the last thirty years. Students learn about the history of immigration and migration in Spain and the increasingly multicultural makeup of Spanish society today. Readings include short stories, novels, memoir, graphic novels, and drama—as well as several films—that explore the experience of (im)migrants from North and Sub-Saharan Africa, China, and Latin America, as well as that of second- and third-generation Spaniards of Asian and African descent. Prerequisite: L5 Spanish placement or previous completion of SPAN 140, 142, or 145. L5, HU

* **SPAN 350a / LAST 351a, Borges: Literature and Power** Aníbal González Perez
An introduction to the work of Jorge Luis Borges, focusing on the relation between literature and power as portrayed in selected stories, essays, and poems. Topics include Borges and postmodernity; writing and ethics; and Borges's politics. Works include *Ficciones*, *Otras inquisiciones*, *El aleph*, *El hacedor*, *El informe de Brodie*, and *Obra poética*. Open to students who have placed into L5 courses or who have successfully completed an L4 course in Spanish. Counts toward the Spanish major. L5, HU

* **SPAN 352a, Ethics and Politics in the Spanish American Short Story** Aníbal González Perez

Survey of the twentieth-century Spanish American short story, focused on the links among ethics, politics, and writing. Representation of ethics in narrative fiction; metaphorical links between writing and violence; tension between artistic integrity and political commitment. L5, HU

* **SPAN 353b, Spanish American Vanguardist Literature** Aníbal González Perez
Introduction to the Vanguardist period in Spanish American cultural history. The effects of political and social change in the early twentieth century on Spanish American writers and artists. Tensions between playfulness and engagement, cosmopolitanism and regionalism, and creativity and conscience in Vanguardist works. L5, HU

* **SPAN 367a / HIST 227a, The Spanish Civil War: Words and Images** Noél Valis
An introduction to the history and cultural-literary impact of the Spanish Civil War (1936–39) from national and international perspectives. Views both from within and from outside the war; women and the war; memory and the war. Authors include George Orwell, Ernest Hemingway, Javier Cercas, Alberto Méndez, Mercè Rodoreda, Ramón J. Sender, W. H. Auden, and Stephen Spender. Open to students who have

placed into L5 courses or who have successfully completed an L4 course in Spanish.
Counts toward the Spanish major. L5, HU

SPAN 398a / AFAM 180a / LAST 398a / LITR 329a, Caribbean Baseball: A Cultural History Roberto González Echevarría

A study of the origins and evolution of baseball in the Caribbean (Cuba, Dominican Republic, Puerto Rico) in the context of the region's political and cultural history and its relationship with the United States. The course begins with a consideration of the nature of games and the development and dissemination of sports by imperial powers since the nineteenth century: soccer, rugby, and tennis by the UK and basketball and baseball by the U.S. Topics to be considered: nationalism, the role of race, popular culture, the development of the media, the rise of stars and famous teams, the importance of the Negro Leagues, access of Caribbean players to the Major Leagues, the situation in the present. WR, HU

SPAN 404b / ANTH 264b / ARCG 264b, Aztec Archaeology and Ethnohistory
Oswaldo Chinchilla Mazariegos

An anthropological and ethnohistorical examination of the Aztec civilization that dominated much of Mexico from the fourteenth century until the Spanish Conquest of 1521. SO

*** SPAN 478a and SPAN 479b, Directed Readings and/or Individual Research** Noël Valis

Individual study under faculty supervision. The student must submit a bibliography and a written plan of study approved by the faculty adviser to the director of undergraduate studies. No reading or research course credit is granted without prior approval from the director of undergraduate studies. The student must meet with the instructor at least one hour a week. A final examination or essay is required.

*** SPAN 491a or b, The Senior Essay** Noël Valis

A research project completed under faculty supervision and resulting in a paper of considerable length, in Spanish.

Special Divisional Majors

Director of undergraduate studies: Sarah Mahurin (sarah.mahurin@yale.edu), Dean's Office TD, 432-0754

A Special Divisional Major affords an alternative for students whose academic interests cannot be met by an existing departmental or special major. Students may, with the approval of the Committee on Honors and Academic Standing, design majors of their own in consultation with members of the faculty and in accordance with the procedures outlined below.

Special Divisional Majors differ so widely in content that there is no uniform format, but two patterns prevail. Some majors combine two disciplines (e.g., music and English, religious studies and anthropology), while others draw from several departments to focus on a particular culture, period, or problem (e.g., French studies, medieval studies, urban studies). Students interested in pursuing a Special Divisional Major in Renaissance studies should visit the Renaissance Studies program website. A Special Divisional Major may not be offered as one of two majors.

Students considering a Special Divisional Major should be aware of its particular demands and risks. They face the challenges of interdisciplinary work and must grapple with the conceptual processes of disparate disciplines. They must establish criteria for selecting courses and organize their courses in order to obtain an adequate base in the fields necessary for advanced work on a specific topic.

Students in a Special Divisional Major may get little help in designing their programs. Because they are in separate, independent programs, they forfeit some of the services normally provided as part of a departmental or special major. They must, for example, find their own advisers. They need to ask the help of faculty members already committed to other departments and programs who may not share their interdisciplinary interests. They must acquire the necessary background and sustain their interest without the help of any special seminar. They may lose other advantages of departmental affiliation, such as priority for acceptance in restricted-enrollment courses, opportunities to meet students and faculty members with similar interests, and participation in a program easily understood by graduate schools and others. Their transcripts will carry only the notation "Special Divisional Major," without specifying the student's field of concentration.

Before applying for a Special Divisional Major, students are urged to consult the directors of undergraduate studies (DUSes) in their fields of major interest, who can advise them whether a Special Divisional Major is necessary. Special interests can usually be accommodated within an existing major.

PREREQUISITES

Because of the variety of programs, there are no uniform prerequisites. All students must satisfy their prospective advisers and the Committee that they have obtained adequate preparation for the advanced courses and senior projects they propose.

REQUIREMENTS OF THE MAJOR

The major ordinarily comprises at least twelve advanced term courses and a senior project. Advanced courses include all but prerequisites for majors, beginning language

courses, and comparable courses. When appropriate, approval is granted for graduate courses, tutorials, and residential college seminars. No distinction is made in the Special Divisional Major between standard and intensive majors.

The DUS in the Special Divisional Major presents proposals for the major to the Committee on Honors and Academic Standing. General problems connected with a student's program may be discussed with the DUS. Students who revise their original proposal or change faculty advisers must obtain the Committee's approval. The Committee advises the Yale College Faculty whether or not the student has completed a major and may not be able to recommend students for the degree who have changed their programs without proper consultation.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the major.

SENIOR REQUIREMENT

No later than midterm of their seventh term of enrollment, and after consultation with their faculty advisers, students provide the Committee with an outline of their plans for the senior project. There are several options: a written or oral examination, a senior essay or project, or, in some circumstances, a graduate course or a tutorial. A senior essay usually offers the most effective means of integrating material from more than one discipline, and students in a Special Divisional Major typically request one course credit in each term of the senior year in SPEC 491, 492, The Senior Project.

Students who offer a yearlong senior project must, in order to continue the course into the second term, provide their advisers with substantial written evidence of their progress (i.e., a draft or detailed outline) by the end of their seventh term. The project must be completed no later than two weeks before the last day of classes in the student's eighth term of enrollment. At least two faculty members evaluate it.

ADVISING AND APPLICATION TO THE MAJOR

Advisers Candidates must arrange for faculty advisers before applying. DUSes or department chairs can usually suggest advisers. The Committee expects each student to obtain a primary adviser from the department that forms the principal component of the major, as well as one or more adjunct advisers from other fields. The primary adviser must be a regular member of the Yale College faculty. Members of the faculties of other schools of the University and visiting faculty members may serve as adjunct advisers.

Both advisers and students assume special responsibilities when designing and completing a major that falls outside existing programs. The special nature of the program and the student's loss of departmental affiliation make it particularly important for the faculty adviser to meet regularly with the student to help plan the program and to supervise its completion, including the senior project.

The primary adviser assumes chief responsibility for reporting the student's progress to the Committee and for assigning a grade to the senior project. The primary adviser also consults the student's other advisers and works with them in directing, evaluating, and grading the senior project.

Application Students considering a Special Divisional Major are invited to talk with DUSes and with their residential college deans at any stage in their planning. Candidates may apply for admission as early as their fourth term of enrollment, but

must have done so no later than one month after their seventh term of enrollment begins. The Committee's experience suggests that the last term of the sophomore or the first term of the junior year is the best time to apply.

Lucidity, coherence, and completeness in an application are of primary importance to a student's candidacy, since they are indications of a thoughtfully prepared program of study and of the qualities of eagerness and initiative essential to a successful Special Divisional Major. The Committee expects that applicants will have worked in close collaboration with the director of undergraduate studies (DUS) of the Special Divisional Major in developing their proposals, and it will normally view failure to do so as grounds for rejection of the application.

Application forms are available at the Timothy Dwight College Dean's Office. They are submitted, along with letters of support from faculty advisers, to the Committee on Honors and Academic Standing, in care of the Timothy Dwight College Dean's Office. The Committee meets to consider proposals several times a year. All students in good standing are eligible, although the Committee must be satisfied that candidates have particular aptitude and preparation for the work they propose.

In approving or rejecting proposals for a Special Divisional Major, the Committee looks principally at the quality of the student's planning. What are the objectives of the program? What are the principles for selecting courses and organizing material? Is the program comparable in breadth and depth to other majors in Yale College? What provisions have been made to guide and evaluate the student's progress? What sort of senior project would focus and integrate the program? Finally, are the objectives of the program best served by a Special Divisional Major? The Committee will not approve a major if the student can accomplish the desired aims in an existing major; the Committee may consult DUSes and other faculty members to judge whether or not this is the case.

REQUIREMENTS OF THE MAJOR

Prerequisite Approval of 2 or more faculty advisers and Committee on Honors and Academic Standing

Number of courses 13 term courses (incl one-term senior essay) or 14 term courses (incl two-term senior essay)

Distribution of courses Advanced courses in 2 or more appropriate depts; grad courses, college sems, or tutorials with DUS permission

Senior requirement Senior essay or project (SPEC 491 and/or 492), or, with DUS permission, written or oral exam, grad course, or tutorial

Statistics and Data Science

Director of undergraduate studies: Sekhar Tatikonda (sekhar.tatikonda@yale.edu), Rm. 338, 17 Hillhouse Ave., 432-4714; statistics.yale.edu; Major FAQ and guide; undergraduate major checklist

Statistics is the science and art of prediction and explanation. The mathematical foundation of statistics lies in the theory of probability, which is applied to problems of making inferences and decisions under uncertainty. Practical statistical analysis also uses a variety of computational techniques, methods of visualizing and exploring data, methods of seeking and establishing structure and trends in data, and a mode of questioning and reasoning that quantifies uncertainty. Data science expands on statistics to encompass the entire life cycle of data, from its specification, gathering, and cleaning, through its management and analysis, to its use in making decisions and setting policy. This field is a natural outgrowth of statistics that incorporates advances in machine learning, data mining, and high-performance computing, along with domain expertise in the social sciences, natural sciences, engineering, management, medicine, and digital humanities.

Students majoring in Statistics and Data Science take courses in both mathematical and practical foundations. They are also encouraged to take courses in the discipline areas listed below.

The B.A. in Statistics and Data Science is designed to acquaint students with fundamental techniques in the field. The B.S. prepares students to participate in research efforts or to pursue graduate school in the study of data science.

COURSES FOR NONMAJORS AND MAJORS

S&DS 100 and S&DS 101–109 and S&DS 123 (YData) only assume knowledge of high-school mathematics. Students who complete one of these courses should consider taking S&DS 230. This sequence provides a solid foundation for the major. Other courses for nonmajors include S&DS 110 and 160.

PREREQUISITES

Multivariable calculus is required and should be taken before or during the sophomore year. This requirement may be satisfied by one of MATH 120, ENAS 151, MATH 230, or the equivalent.

REQUIREMENTS OF THE MAJOR

Students who wish to major in Statistics and Data Science are encouraged to take S&DS 220 or a 100-level course followed by S&DS 230. Students should complete the calculus prerequisite and linear algebra requirement (MATH 222 or 225) as early as possible, as they provide mathematical background that is required in many courses.

B.A. degree program The B.A. degree program requires eleven courses, ten of which are from the seven discipline areas described below: MATH 222 or 225 from Mathematical Foundations and Theory; two courses from Core Probability and Statistics; two courses that provide Computational Skills; two courses on Methods of Data Science; and three courses from any of the discipline areas. The remaining course is fulfilled through the senior requirement.

B.S. degree program The B.S. degree program requires fourteen courses, including all the requirements for the B.A. degree as well as S&DS 242, which counts as one of the required courses from Core Probability and Statistics. The two remaining courses may be chosen from Core Probability and Statistics, Computational Skills, Methods of Data Science, Mathematical Foundations and Theory, or Efficient Computation and Big Data discipline areas.

Discipline Areas The seven discipline areas are listed below.

Core Probability and Statistics These are essential courses in probability and statistics. Every major should take at least two of these courses, and should probably take more. Students completing the B.S. degree must take S&DS 242.

Examples of such courses include: S&DS 238, 241, 242, 312, 351

Computational Skills Every major should be able to compute with data. While the main purpose of some of these courses is not computing, students who have taken at least two of these courses will be capable of digesting and processing data. While there are other courses that require more programming, at least two courses from the following list are essential.

Examples of such courses include: S&DS 220 or 230, course 262, 425, CPSC 100 or 112, or ENAS 130 (substitution of CPSC 201 or 223 is permitted)

Methods of Data Science These courses teach fundamental methods for dealing with data. They range from practical to theoretical. Every major must take at least two of these courses.

Examples of such courses include: S&DS 313, 361, 363, 365, 430, 468, EENG 400, CPSC 477

Mathematical Foundations and Theory All students in the major must know linear algebra as taught in MATH 222 or 225. Students who have learned linear algebra through other courses (such as MATH 230, 231) may substitute another course from this category. Students pursuing the B.S. degree must take at least two courses from this list and those students contemplating graduate school should take additional courses from this list as electives.

Examples of such courses include: S&DS 364, 400, 410, 411, CPSC 365, 366, 469, MATH 222, 225, 244, 250, 260, 300, or 301

Efficient Computation and Big Data These courses are for students focusing on programming or implementation of large-scale analyses and are not required for the major. Students who wish to work in the software industry should take at least one of these.

Examples of such courses include: CPSC 223, 323, 424, 437

Data Science in Context Students are encouraged to take courses that involve the study of data in application areas. Students learn how data are obtained, how reliable they are, how they are used, and the types of inferences that can be made from them. These course selections should be approved by the director of undergraduate studies (DUS).

Examples of such courses include: ANTH 376, EVST 362, GLOBL 191, 195, LING 229, 234, 380, PLSC 454, PSYC 258

Methods in Application Areas These are methods courses in areas of applications. They help expose students to the cultures of fields that explore data. These course selections should be approved by the DUS.

Examples of such courses include: CPSC 453, 470, 475, ECON 136, 420, EENG 445, S&DS 352, LING 227

Substitution Some substitution, particularly of advanced courses, may be permitted with DUS approval.

Credit/D/Fail A maximum of one course taken Credit/D/Fail may be counted toward the requirements of the major, with permission of the DUS.

SENIOR REQUIREMENT

Students in both the B.A. degree program and B.S. degree program complete the senior requirement by taking a capstone course (S&DS 425) or an individual research project course. Courses for research opportunities include S&DS 490, S&DS 491, or S&DS 492, and must be advised by a member of the department of Statistics and Data Science or by a faculty member in a related discipline area. Students must complete a research project to be eligible for Distinction in the Major.

ADVISING

Students intending to major in Statistics and Data Science should consult the department's guide and FAQ. Statistics and Data Science can be taken either as a primary major or as one of two majors, in consultation with the DUS. Appropriate majors to combine with Statistics and Data Science include programs in the social sciences, natural sciences, engineering, computer science, or mathematics. A statistics concentration is also available within the Applied Mathematics major.

Combined B.S./M.S. degree program Exceptionally able and well-prepared students may complete a course of study leading to the simultaneous award of the B.S. and M.S. degrees after eight terms of enrollment. See Academic Regulations, section K, Special Arrangements, "Simultaneous Award of the Bachelor's and Master's Degrees. Interested students should consult the DUS prior to the sixth term of enrollment for specific requirements in Statistics and Data Science.

Roadmap See visual roadmap of the requirements.

REQUIREMENTS OF THE MAJOR

Prerequisites *Both degrees* – MATH 120, ENAS 151, MATH 230, or equivalent

Number of courses *B.A.* – 11 term courses beyond prereqs (incl senior req); *B.S.* – 14 term courses beyond prereqs (incl senior req)

Specific courses required *B.A.* – MATH 222 or 225; *B.S.* – same, plus S&DS 242

Distribution of courses *B.A.* – 2 courses from Core Probability and Statistics, 2 courses from Computational Skills, 2 courses from Methods of Data Science, and 3 electives chosen from any discipline area with DUS approval; *B.S.* – same, plus 2 additional electives from any discipline area (except Data Science in Context and Methods in Application Areas) with DUS approval

Substitution permitted With DUS approval

Senior requirement *Both degrees*—Senior Seminar (S&DS 490) or Senior Project (S&DS 491 or S&DS 492) or Statistical Case Studies (S&DS 425)

CERTIFICATE IN DATA SCIENCE

The Certificate in Data Science is designed for students, majoring in disciplines other than Statistics & Data Science, to acquire the knowledge to promote mature use of data analysis throughout society. Students gain the necessary knowledge base and useful skills to tackle real-world data analysis challenges. Students who complete the requirements for the certificate are prepared to engage in data analysis in the humanities, social sciences, and sciences and engineering and are able to manage and investigate quantitative data research and report on that data.

Refer to the S&DS website for more information.

PREREQUISITE

The suggested prerequisite for the certificate is an introductory course, selected from one of the following courses, S&DS 100, 101–106, 123 or 220.

REQUIREMENTS OF THE CERTIFICATE

To fulfill the requirements of the certificate, students must take five courses from four different areas of statistical data analysis. No course may be applied to satisfy the requirements of both a major and the certificate. No single course may count for two areas of study. Students are required to earn at least a B– for each course.

Probability and Statistical Theory One from S&DS 238, 240, 241, 242.

Statistical Methodology and Data Analysis Two from S&DS 230, 242, 312, 361, 363. ECON 136 may be substituted for S&DS 242.

Computation & Machine Learning One from S&DS 262, 355, 365, CPSC 223, 477. CPSC 323 may be substituted for CPSC 223.

Data Analysis in a Discipline Area Either two of the half-credit seminars that accompany S&DS 123; or one of the “Data Science in a Discipline Area” courses approved for the data science certificate and listed on the S&DS website.

ADVISING

More information about the certificate, including how to register, is available on the S&DS website.

REQUIREMENTS OF THE CERTIFICATE

Prerequisite 1 term course from S&DS 100, 101–106, 123 or 220

Number of courses 5 term courses

Distribution of courses 1 probability and statistical theory course; 2 statistical methodology and data analysis courses; 1 computational and machine learning course; and 2 half-credit courses or 1 course in discipline area, as specified

FACULTY OF THE DEPARTMENT OF STATISTICS AND DATA SCIENCE

Professors †Donald Andrews, Andrew Barron, †Jeffrey Brock, Joseph Chang, †Katarzyna Chawarska, †Xiaohong Chen, †Nicholas Christakis, †Ronald Coifman, †James Duncan, John Emerson (*Adjunct*), †Debra Fischer, †Alan Gerber, †Mark

Gerstein, John Hartigan (*Emeritus*), †Theodore Holford, †Edward Kaplan, †Harlan Krumholz, John Lafferty, †Peter Phillips, David Pollard (*Emeritus*), †Nils Rudi, †Donna Spiegelman, Daniel Spielman, †Hemant Tagare, †Van Vu, †Heping Zhang, †Hongyu Zhao, Harrison Zhou, †Steven Zucker

Associate Professors †Timothy Armstrong, †Peter Aronow, †Forrest Crawford, Sahand Negahban, Sekhar Tatikonda, Yihong Wu

Assistant Professors Elisa Celis, Jessi Cisewski-Keche, Zhou Fan, †Joshua Kalla, †Amin Karbasi, Roy Lederman, †Vahideh Manshadi, †Fredrik Savje

Senior Lecturer Jonathan Reuning-Scherer

Lecturers Russell Barbour, Winston Lin

†A joint appointment with primary affiliation in another department or school.

S&DS 101 – 106, Introduction to Statistics and Data Science

A basic introduction to statistics, including numerical and graphical summaries of data, probability, hypothesis testing, confidence intervals, and regression. Each course in this group focuses on applications to a particular field of study and is taught jointly by two instructors, one specializing in statistics and the other in the relevant area of application. The first seven weeks of classes are attended by all students in S&DS 101–106 together, as general concepts and methods of statistics are developed. The remaining weeks are divided into field-specific sections that develop the concepts with examples and applications. Computers are used for data analysis. These courses are alternatives; they do not form a sequence and only one may be taken for credit. No prerequisites beyond high school algebra. May not be taken after S&DS 100 or 109.

Students enrolled in S&DS 101–106 who wish to change to S&DS 109, or those enrolled in S&DS 109 who wish to change to S&DS 101–106, must submit a course change notice, signed by the instructor, to their residential college dean by Monday, October 2. The approval of the Committee on Honors and Academic Standing is not required.

S&DS 101a / E&EB 210a, Introduction to Statistics: Life Sciences Jonathan Reuning-Scherer

Statistical and probabilistic analysis of biological problems, presented with a unified foundation in basic statistical theory. Problems are drawn from genetics, ecology, epidemiology, and bioinformatics. QR

S&DS 102a / EP&E 203a / PLSC 452a, Introduction to Statistics: Political Science
Jonathan Reuning-Scherer

Statistical analysis of politics, elections, and political psychology. Problems presented with reference to a wide array of examples: public opinion, campaign finance, racially motivated crime, and public policy. QR

S&DS 103a / EP&E 209a / PLSC 453a, Introduction to Statistics: Social Sciences
Jonathan Reuning-Scherer

Descriptive and inferential statistics applied to analysis of data from the social sciences. Introduction of concepts and skills for understanding and conducting quantitative research. QR

S&DS 105a, Introduction to Statistics: Medicine Jonathan Reuning-Scherer and Russell Barbour

Statistical methods used in medicine and medical research. Practice in reading medical literature competently and critically, as well as practical experience performing statistical analysis of medical data. QR

S&DS 106a, Introduction to Statistics: Data Analysis Jonathan Reuning-Scherer and William Brinda

An introduction to probability and statistics with emphasis on data analysis. QR

Courses in Statistics and Data Science

S&DS 100b, Introductory Statistics Staff

An introduction to statistical reasoning. Topics include numerical and graphical summaries of data, data acquisition and experimental design, probability, hypothesis testing, confidence intervals, correlation and regression. Application of statistical concepts to data; analysis of real-world problems. May not be taken after S&DS 101–106 or 109. QR

S&DS 109a, Introduction to Statistics: Fundamentals Jonathan Reuning-Scherer

General concepts and methods in statistics. Meets for the first half of the term only. May not be taken after S&DS 100 or 101–106. ½ Course cr

[**S&DS 110, An Introduction to R for Statistical Computing and Data Science**]

S&DS 123b / CPSC 123b / S&DS 523b, YData: An Introduction to Data Science Jessi Cisewski-Kehe

Computational, programming, and statistical skills are no longer optional in our increasingly data-driven world; these skills are essential for opening doors to manifold research and career opportunities. This course aims to dramatically enhance knowledge and capabilities in fundamental ideas and skills in data science, especially computational and programming skills along with inferential thinking. YData is an introduction to Data Science that emphasizes the development of these skills while providing opportunities for hands-on experience and practice. YData is accessible to students with little or no background in computing, programming, or statistics, but is also engaging for more technically oriented students through extensive use of examples and hands-on data analysis. Python 3, a popular and widely used computing language, is the language used in this course. The computing materials will be hosted on a special purpose web server. QR

* **S&DS 150b, Data Science Ethics** Elisa Celis

In this course, we introduce, discuss, and analyze ethical issues, algorithmic challenges, and policy decisions that arise when addressing real-world problems via the lens of data science. We grapple with the normative questions of what constitutes bias, fairness, discrimination, or ethics when it comes to data science and machine learning in applications such as policing, health, journalism, and employment. We incorporate technical precision by introducing quantitative measures that allow us to study how algorithms codify, exacerbate and/or introduce biases of their own, and study analytic methods of correcting for or eliminating these biases. Lastly, we study the social implications of these decisions, and understand the legal, political and policy decisions that could be used to govern data-driven decision making by making them transparent and auditable. We read critical commentary by practitioners, state-of-the-art technical

papers by data scientist and computer scientists, and samples of legal scholarship, moral and ethical philosophy, readings in sociology, and policy documents. We often ground our discussions around recent case studies, controversies, and current events. Prerequisites: One from S&DS 238, S&DS 241, S&DS 242, or the equivalent; and one from S&DS 230, ECON 131, or the equivalent. Suggested courses: one from: CPSC 470, S&DS 365, ECON 429, CPSC 365, CPSC 366, or equivalent; and one from: EP&E 215, PHIL 175, PHIL 177, SOCY 144, PLSC 262, PLSC 320, or equivalent. SO

*** S&DS 160b / AMTH 160b / MATH 160b, The Structure of Networks** Ronald Coifman

Network structures and network dynamics described through examples and applications ranging from marketing to epidemics and the world climate. Study of social and biological networks as well as networks in the humanities. Mathematical graphs provide a simple common language to describe the variety of networks and their properties. QR

*** S&DS 171b, YData: Text Data Science: An Introduction** Staff

Written language is the primary means by which humans document their observations of the world, including scientific discoveries, interpretations of history and art, health diagnoses, analyses of political events and economic trends, social interactions, and many others. Increasingly, this rapidly growing transcript is readily available in electronic form, and is being used in commercial applications and to advance scientific knowledge. Text Data Science is an introduction to computational and inferential methods that use text. The focus is on simple but often powerful text processing techniques that do not require linguistic analyses, to gain familiarity with working with text data. Sources used in the seminar include political speeches, Twitter feeds, scientific journals, online FAQ and discussion boards, Wikipedia, news articles, and consumer product reviews. Methodologies include scraping, wrangling, hashing, sorting, regressing, embedding, and probabilistic modeling. The course is based on the Python programming language within a cloud computing platform, and is paced to be accessible to students who have previously taken or are currently enrolled in YData (S&DS 123). Prerequisite: S&DS 123, which may be taken concurrently. QR
½ Course cr

*** S&DS 172b / EP&E 328b / PLSC 347b, YData: Data Science for Political Campaigns** Joshua Kalla

Political campaigns have become increasingly data driven. Data science is used to inform where campaigns compete, which messages they use, how they deliver them, and among which voters. In this course, we explore how data science is being used to design winning campaigns. Students gain an understanding of what data is available to campaigns, how campaigns use this data to identify supporters, and the use of experiments in campaigns. This course provides students with an introduction to political campaigns, an introduction to data science tools necessary for studying politics, and opportunities to practice the data science skills presented in S&DS 123, YData.

Prerequisite: S&DS 123, which may be taken concurrently. QR ½ Course cr

S&DS 220b, Introductory Statistics, Intensive Joseph Chang

Introduction to statistical reasoning for students with particular interest in data science and computing. Using the R language, topics include exploratory data analysis, probability, hypothesis testing, confidence intervals, regression, statistical modeling,

and simulation. Computing taught and used extensively, as well as application of statistical concepts to analysis of real-world data science problems. MATH 115 is helpful but not required. While no particular prior experience in computing is required, strong motivation to practice and learn computing are desirable. QR

S&DS 230a or b, Data Exploration and Analysis Staff

Survey of statistical methods: plots, transformations, regression, analysis of variance, clustering, principal components, contingency tables, and time series analysis. The R computing language and Web data sources are used. Prerequisite: a 100-level Statistics course or equivalent, or with permission of instructor. QR

S&DS 238a, Probability and Statistics Joseph Chang

Fundamental principles and techniques of probabilistic thinking, statistical modeling, and data analysis. Essentials of probability, including conditional probability, random variables, distributions, law of large numbers, central limit theorem, and Markov chains. Statistical inference with emphasis on the Bayesian approach: parameter estimation, likelihood, prior and posterior distributions, Bayesian inference using Markov chain Monte Carlo. Introduction to regression and linear models. Computers are used for calculations, simulations, and analysis of data. After or concurrently with MATH 118 or 120. QR

S&DS 241a / MATH 241a, Probability Theory Winston Lin

Introduction to probability theory. Topics include probability spaces, random variables, expectations and probabilities, conditional probability, independence, discrete and continuous distributions, central limit theorem, Markov chains, and probabilistic modeling. After or concurrently with MATH 120 or equivalent. QR

S&DS 242b / MATH 242b, Theory of Statistics Andrew Barron

Study of the principles of statistical analysis. Topics include maximum likelihood, sampling distributions, estimation, confidence intervals, tests of significance, regression, analysis of variance, and the method of least squares. Some statistical computing. After S&DS 241 and concurrently with or after MATH 222 or 225, or equivalents. QR

S&DS 262a / AMTH 262a / CPSC 362a, Computational Tools for Data Science Roy Lederman

Introduction to the core ideas and principles that arise in modern data analysis, bridging statistics and computer science and providing students the tools to grow and adapt as methods and techniques change. Topics include principle component analysis, independent component analysis, dictionary learning, neural networks and optimization, as well as scalable computing for large datasets. Assignments will include implementation, data analysis and theory. Students require background in linear algebra, multivariable calculus, probability and programming. Prerequisites: after or concurrently with MATH 222, 225, or 231; after or concurrently with MATH 120, 230, or ENAS 151; after or concurrently with CPSC 100, 112, or ENAS 130; after S&DS 100-108 or S&DS 230 or S&DS 241 or S&DS 242. QR

S&DS 312a, Linear Models Joseph Chang

The geometry of least squares; distribution theory for normal errors; regression, analysis of variance, and designed experiments; numerical algorithms, with particular reference to the R statistical language. After S&DS 242 and MATH 222 or 225. QR

*** S&DS 314b, Introduction to Causal Inference** Winston Lin

Introduction to causal inference with applications to the social and health sciences. Topics include randomized experiments, matching and propensity score methods, sensitivity analysis, instrumental variables, and regression discontinuity designs. Mathematical problems, data analysis in R, and critical discussions of published applied research. Prerequisite: S&DS 242 and some programming experience in R. QR

S&DS 315a / PLSC 340, Measuring Impact and Opinion Change Joshua Kalla

This course introduces students to measuring impact. Political campaigns, marketers, governments, and non-profit organizations regularly try to produce opinion change through TV, radio, online ads, mail, and door-to-door canvassing. Are these efforts successful at producing opinion change? In this course, we learn how to use experiments and natural experiments to measure the impact of opinion change efforts, and how to be appropriately skeptical of findings that claim to measure impact. This course also teaches data analysis skills in R. Prerequisite: S&DS 242 and some programming experience in R. QR

S&DS 351b / EENG 434b / MATH 251b, Stochastic Processes Amin Karbasi

Introduction to the study of random processes including linear prediction and Kalman filtering, Poisson counting process and renewal processes, Markov chains, branching processes, birth-death processes, Markov random fields, martingales, and random walks. Applications chosen from communications, networking, image reconstruction, Bayesian statistics, finance, probabilistic analysis of algorithms, and genetics and evolution. Prerequisite: S&DS 241 or equivalent. QR

S&DS 352b / MB&B 452b / MCDB 452b, Biomedical Data Science, Mining and Modeling Mark Gerstein and Matthew Simon

Techniques in data mining and simulation applied to bioinformatics, the computational analysis of gene sequences, macromolecular structures, and functional genomics data on a large scale. Sequence alignment, comparative genomics and phylogenetics, biological databases, geometric analysis of protein structure, molecular-dynamics simulation, biological networks, microarray normalization, and machine-learning approaches to data integration. Prerequisites: MB&B 301 and MATH 115, or permission of instructor. SC

S&DS 355a, Introductory Machine Learning John Lafferty

This course covers the key ideas and techniques in machine learning without the use of advanced mathematics. Basic methodology and relevant concepts are presented in lectures, including the intuition behind the methods. Assignments give students hands-on experience with the methods on different types of data. Topics include linear regression and classification, tree-based methods, clustering, topic models, word embeddings, recurrent neural networks, dictionary learning and deep learning. Examples come from a variety of sources including political speeches, archives of scientific articles, real estate listings, natural images, and several others. Programming is central to the course, and is based on the Python programming language. Prerequisites: Two of the following courses: S&DS 230, 238, 240, 241 and 242; previous programming experience (e.g., R, Matlab, Python, C++), Python preferred.

QR

S&DS 361b / AMTH 361b, Data Analysis Staff

Selected topics in statistics explored through analysis of data sets using the R statistical computing language. Topics include linear and nonlinear models, maximum likelihood, resampling methods, curve estimation, model selection, classification, and clustering. After S&DS 242 and MATH 222 or 225, or equivalents. QR

S&DS 363b, Multivariate Statistics for Social Sciences Jonathan Reuning-Scherer

Introduction to the analysis of multivariate data as applied to examples from the social sciences. Topics include principal components analysis, factor analysis, cluster analysis (hierarchical clustering, k-means), discriminant analysis, multidimensional scaling, and structural equations modeling. Extensive computer work using either SAS or SPSS programming software. Prerequisites: knowledge of basic inferential procedures and experience with linear models. QR

S&DS 364b / AMTH 364b / EENG 454b, Information Theory Andrew Barron

Foundations of information theory in communications, statistical inference, statistical mechanics, probability, and algorithmic complexity. Quantities of information and their properties: entropy, conditional entropy, divergence, redundancy, mutual information, channel capacity. Basic theorems of data compression, data summarization, and channel coding. Applications in statistics and finance. After STAT 241. QR

S&DS 365a or b, Applied Data Mining and Machine Learning Derek Feng

Techniques for data mining and machine learning from both statistical and computational perspectives, including support vector machines, bagging, boosting, neural networks, and other nonlinear and nonparametric regression methods. Discussion includes the basic ideas and intuition behind these methods, a more formal understanding of how and why they work, and opportunities to experiment with machine learning algorithms and to apply them to data. After S&DS 242. QR

S&DS 400b / MATH 330b, Advanced Probability Sekhar Tatikonda

Measure theoretic probability, conditioning, laws of large numbers, convergence in distribution, characteristic functions, central limit theorems, martingales. Some knowledge of real analysis assumed. QR

S&DS 410a, Statistical Inference Zhou Fan

A systematic development of the mathematical theory of statistical inference covering methods of estimation, hypothesis testing, and confidence intervals. An introduction to statistical decision theory. Prerequisite: level of S&DS 241.

*** S&DS 425b, Statistical Case Studies** John Emerson

Statistical analysis of a variety of statistical problems using real data. Emphasis on methods of choosing data, acquiring data, assessing data quality, and the issues posed by extremely large data sets. Extensive computations using R statistical software. Prerequisites: prior course work in probability and statistics, and a data analysis course at the level of STAT 361, 363, or 365 (or STAT 220, 230 if supported by other course work). QR

*** S&DS 430a / AMTH 437a / ECON 413a / EENG 437a, Optimization Techniques**

Sekhar Tatikonda

Fundamental theory and algorithms of optimization, emphasizing convex optimization. The geometry of convex sets, basic convex analysis, the principle of optimality, duality. Numerical algorithms: steepest descent, Newton's method, interior point methods, dynamic programming, unimodal search. Applications from engineering and the

sciences. Prerequisites: MATH 120 and 222, or equivalents. May not be taken after AMTH 237. QR

*** S&DS 480a or b, Individual Studies** Sekhar Tatikonda

Directed individual study for qualified students who wish to investigate an area of statistics not covered in regular courses. A student must be sponsored by a faculty member who sets the requirements and meets regularly with the student. Enrollment requires a written plan of study approved by the faculty adviser and the director of undergraduate studies.

[S&DS 490, Senior Seminar and Project]

S&DS 491a and S&DS 492b, Senior Project Sekhar Tatikonda

Individual research that fulfills the senior requirement. Requires a faculty adviser and DUS permission. The student must submit a written report about results of the project.

**GRADUATE COURSES OF PARTICULAR INTEREST TO
UNDERGRADUATES**

Courses in the Graduate School are open to qualified undergraduates. Descriptions of graduate courses in Statistics & Data Science are available on the departmental website. Permission of the instructor and of the director of graduate studies is required.

Study of the City

Courses

* **STCY 176b / ARCH 230b, Introduction to the Study of the City** Alexander Garvin
An examination of forces shaping American cities and strategies for dealing with them. Topics include housing, commercial development, parks, zoning, urban renewal, landmark preservation, new towns, and suburbs. The course includes games, simulated problems, fieldwork, lectures, and discussion. SO

Theater Studies

Director of undergraduate studies: Shilarna Stokes (shilarna.stokes@yale.edu), Rm. 102, 220 York St., 432-1310; theaterstudies.yale.edu; theaterstudies.yale.edu/dance-studies-yale

As a branch of the humanities and as a complex cultural practice, theater claims a rich history and literature and an equally rich repertoire of embodied knowledge and theory. Theater Studies emphasizes the reciprocal relationship between practice and scholarly study. The major combines practical training with theory and history, while stressing creative critical thinking. Students are encouraged to engage intellectual and physical approaches to explore diverse cultural forms, historical traditions, and contemporary life. As the study of theater is interdisciplinary in scope and global in perspective, students are expected to take courses in cognate disciplines such as history, philosophy, anthropology, political science, film, art, literature, and foreign languages. Faculty members are affiliated with a range of departments; their diverse expertise lends breadth and depth to course offerings and enables students to devise a course of study reflective of their developing interests.

Special features of the program are the production seminars, guided independent study projects, and senior project. Each production seminar concentrates on study, through practice, of one aspect of work in the theater; examples are approaches to acting, directing, writing, dance, design, or digital media in performance. Each seminar involves numerous projects that grow out of the term's work. For example, the project may be the production of a play or several plays, adaptation or translation of existing works, or creation of original plays, performance pieces, or set design. Independent study projects give the student freedom to pursue individual and group-generated projects under the guidance of a Theater Studies faculty member. All production seminars require permission of the instructor (by application or audition). Independent study project courses are open only to majors.

PREREQUISITES

The prerequisites for the major are THST 110 and THST 111.

REQUIREMENTS OF THE MAJOR

The major consists of ten term courses beyond the introductory prerequisites (THST 110, 111), one of which must be THST 210, Introduction to Performance Concepts. Students are encouraged to enroll in a balanced combination of courses involving studio work and courses with literature, history, and theory content. Of the ten required term courses, four must focus on dramatic literature or theater history. At least one of the four courses should include dramatic literature originating in a language other than English. Students are urged to read plays in the original languages whenever possible. Students should choose additional courses to develop the perspectives achieved in the production and literature courses.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the requirements of the major in Theater Studies.

SENIOR REQUIREMENTS

Majors satisfy the senior project requirement in one of two ways. They may, with the approval of the director of undergraduate studies (DUS), take one of the dramatic literature or theater history courses, or a production seminar, as a senior seminar; in such cases, the expectations for the term paper are substantially higher for students using the course to fulfill their senior requirement. Or, a student may undertake a one-term senior project (THST 491). Senior projects may take the form of directing, designing, writing a play or musical, performing a role, choreographing a dance piece, or writing a critical essay. Performance-oriented projects are in addition to a senior essay, which is an integral requirement of THST 491. For students interested in mounting a production as part of their senior project, collaboration with fellow seniors is strongly encouraged, and collaborative projects will be given preference in the selection process. While collaboration is an important criterion considered by the faculty, it in itself does not guarantee that a project will be selected for inclusion in the curricular season. Proposals for senior project productions will normally be approved only for students who have previously served as producers of other students' senior projects.

Students wishing to undertake a senior project must submit a proposal before the deadline announced by the DUS. This deadline typically falls before spring break of the junior year; students in the junior year will be provided with information and guidance towards the preparation of this rigorous proposal in the months leading up to the deadline. Each proposal is submitted to a faculty committee for approval.

ADVISING

Courses in the School of Drama Majors in Theater Studies are encouraged to consider taking selected courses in design, dramaturgy, and theater management, with permission of the instructor, the DUS, and the registrar of the School of Drama. Undergraduates may not, however, enroll in acting or directing courses offered by the School of Drama. Students enrolling in School of Drama courses should note that a maximum of four term courses from the professional schools may be offered toward the bachelor's degree. Students also should note that the academic calendars of the School of Drama and of Yale College differ. The School of Drama calendar should be consulted for scheduling.

REQUIREMENTS OF THE MAJOR

Prerequisites THST 110, 111

Number of courses 10 term courses beyond prereqs (incl senior req)

Specific course required THST 210

Distribution of courses 4 courses in dramatic lit or theater hist, 1 with reading in lit other than English

Senior requirement Senior seminar or senior project (THST 491)

FACULTY ASSOCIATED WITH THE PROGRAM OF THEATER STUDIES

Professors Daphne Brooks (*African American Studies, American Studies, Theater Studies*), James Bundy (*School of Drama, Theater Studies*), David Chambers (*Adjunct*), *Toni Dorfman (*Adjunct*) (*Theater Studies*), *Daniel Harrison (*Music*), Joan MacIntosh (*Practice*) (*Theater Studies, School of Drama*), *Lawrence Manley (*English*), *Deb Margolin (*Practice*) (*Theater Studies*), Donald Margulies (*Adjunct*) (*English, Theater*)

Studies), *Charles Musser (*Film & Media Studies, American Studies, Theater Studies*), Tavia Nyong'o (*Theater Studies, American Studies*), *Marc Robinson (*School of Drama, Theater Studies, English*), Gregory Wallace (*Practice*) (*School of Drama, Theater Studies*)

Associate Professor Emily Coates (*Adjunct*) (*Theater Studies, School of Drama*)

Assistant Professor Elise Morrison (*Theater Studies*)

Lecturers Hal Brooks, Lacina Coulibaly, Alan Edwards, Daniel Egan, Grant Herreid, Irène Hultman, Annette Jolles, Michael Korie, Bronwen MacArthur, Marsha Norman, Lynda Paul, Nathan Roberts, Renee Robinson, Brian Seibert, Shilarna Stokes, Daniel Ulbricht

*Member of the Executive Committee for the program.

Core Curriculum in Theater Studies

THST 110a and THST 111b, Survey of Theater and Drama Shilarna Stokes

An introduction to theater history, plays, aesthetic theories, and performance techniques. From antiquity to the Restoration period in the fall and continuing through to the present in the spring. HU

* **THST 210a, Introduction to Performance Concepts** Staff

A studio introduction to the basic techniques of acting, including the actor's vocabulary and performance tools. Improvisation, performance exercises, and scene work based on Stanislavsky, Vakhtangov, Michael Chekhov, Strasberg, Adler, Meisner, and Hagen. Admission by audition. Open to Theater Studies majors only. Required for Theater Studies majors in the year immediately following THST 110, 111. RP

Drama and Dance: History, Theory, Literature

* **THST 097b, Anatomy in Motion** Bronwen MacArthur

The connection between advances in human anatomy and kinesiology—the science of human movement—and dance practices from the early 1900s to the present. Study of seminal texts and practical exercises that drove the research of Frederick M. Alexander, Mabel Elsworth Todd, Barbara Clark, and Lulu Sweigard and the application of their ideas in contemporary movement practices today. Topics include the synthesis of dance and science; the reeducation of alignment, posture and balance; the use of imagery; and the unification of mind and body. No prior dance experience required. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.

HU

* **THST 098a, Composing and Performing the One Person Play** Hal Brooks

First-year actors, playwrights, directors, and even students who have never considered taking a theater class, create their own work through a combination of reading, analysis, writing, and on-your-feet exercises. Students read texts and view performances that are generated by one actor in an attempt to discover the methodology that works best for their own creations. The course culminates with a midterm and final presentation created and performed by the student. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.

* **THST 215a / ENGL 434a, Writing Dance** Brian Seibert

The esteemed choreographer Merce Cunningham once compared writing about dance to trying to nail Jello-O to the wall. This seminar and workshop takes on the challenge. Taught by a dance critic for the New York Times, the course uses a close reading of exemplary dance writing to introduce approaches that students then try themselves, in response to filmed dance and live performances in New York City, in the widest possible variety of genres. No previous knowledge of dance is required. WR, HU

* **THST 236a / MUSI 185a, American Musical Theater History** Daniel Egan

Critical examination of relevance and context in the history of the American musical theater. Historical survey, including nonmusical trends, combined with text and musical analysis. WR, HU

* **THST 330b / HUMS 320 / LITR 324b, Representations of the Underworld** Toni Dorfman

What is the underworld? What questions have different ideas about the underworld posed about mortality, freedom, and goodness? Topics include dreams, hell, ghosts, the unconscious, and string theory. Sophomore standing required. HU

* **THST 338b, Current Trends in Musical Theater** Daniel Egan

Exploration of musical theater created in the last ten years, with consideration of works conceived as commercial vs. those produced in non-commercial venues or developmental readings. Texts include librettos, scripts, recordings, videotapes, published essays, and analyses. These multiple approaches to understanding scores incorporate questions of how best to access multi-genre work. Attendance at selected performances in and around New York City. Music reading ability is assumed. Permission of instructor required. HU RP

* **THST 347b, Stanislavski and his Rebellious Protégés: Foundations of Modern Acting and Directing** David Chambers

We begin in Moscow with a deep study of the radical stage innovations of Konstantin Stanislavski, and explore America's insufficient knowledge of his lifetime of research. Of equal value for theatre-makers today will our active examination of the artistic rebellions of Stanislavski's most brilliant proteges of the revolutionary era: Vsevolod Meyerhold (biomechanics), Evgeny Vakhtangov (fantastic realism), and Mikhail Chekhov (psychological gesture). Through reading, video research, student presentations, and on-the-floor physical exercises, we engage in lively conversations with these foundational masters, always seeking inspiration and revelation for our own theatrical work in today's world.

* **THST 370b / PLSH 248b, Polish Theater and Its Traditions** Krystyna Illakowicz

Exploration of the rebellious, defiant, and explosive nature of Polish theater, including ways in which theater has challenged, ridiculed, dissected, and disabled oppressive political power. Polish experimental and absurdist traditions that resulted from a merger of the artistic and the political; environmental and community traditions of the Reduta Theatre; Polish-American theater connections. Includes attendance at live theater events as well as meetings with Polish theater groups and actors. HU TR

* **THST 380b / AMST 370b, The History of Dance** Brian Seibert

An examination of major movements in the history of concert and social dance from the late nineteenth century to the present, including ballet, tap, jazz, modern, musical theater, and different cultural forms. Topics include tradition versus innovation, the

influence of the African diaspora, and interculturalism. Exercises are used to illuminate analysis of the body in motion. WR, HU

* **THST 390a / ENGL 222a, Modern European Drama** Marc Robinson

Intensive study of the major playwrights of modern European drama— Ibsen, Chekhov, Strindberg, Shaw, Brecht, and Beckett— along with pertinent theater theory. WR, HU

* **THST 416a / ENGL 384a / FILM 461a / LITR 364a, British Cinema** Katie

Trumpener

Survey of the British film tradition, emphasizing overlap with literature, drama, and art; visual modernism; documentary's role in defining national identity; "heritage" filmmaking and alternative approaches to tradition; and auteur and actors' cinema. HU
RP

Playwriting, Production, and Performance

* **THST 098a, Composing and Performing the One Person Play** Hal Brooks

First-year actors, playwrights, directors, and even students who have never considered taking a theater class, create their own work through a combination of reading, analysis, writing, and on-your-feet exercises. Students read texts and view performances that are generated by one actor in an attempt to discover the methodology that works best for their own creations. The course culminates with a midterm and final presentation created and performed by the student. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.

* **THST 200b, Introduction to Theatrical Violence** Michael Rossmly

Engagement in a theoretical and practical exploration of depicting violence in theater. Actors learn to execute the illusions of violence on stage both safely and effectively, and the skills of collaboration, partner awareness, concentration, and impulse response. Preference given to Theater Studies majors.

* **THST 207b / ENGL 214b, Introduction to Dramaturgy** Lynda Paul

Introduction to the discipline of dramaturgy. Study of dramatic literature from the ancient world to the contemporary, developing the core skills of a dramaturg. Students analyze plays for structure and logic; work with a director on production of a classical text; work with a playwright on a new play; and work with an ensemble on a devised piece. WR, HU

* **THST 211b, Intermediate Acting** Joan MacIntosh

Continued study of acting as an art, building on performance concepts introduced in THST 210. Various approaches to the actor's task, requiring deeper understanding of conceptual issues and increasing freedom and individuality in building a character. Exercises, monologues, and scene work. Admission by audition. Prerequisite: THST 210. HU RP

* **THST 212b, Community Engaged Theater: US Companies, Productions, and Practices** Shilarna Stokes

This seminar introduces students to the contemporary art and practice of community engaged theater, which connect professional artists to people from various walks of life who have stories to tell and ideas to express, and who want to explore performance as a medium of communication. Alongside readings that introduce students to the historical, theoretical, ethical, and artistic contexts of community-engaged theater in the United States, students learn about several major companies currently producing work

in this field: Theatre of the Oppressed-NYC, Cornerstone Theater Company, Roadside Theater, Sojourn Theatre, Albany Park Theatre Project, and Urban Bush Women. In addition to studying their productions and processes through readings and visual materials, students have regular opportunities to acquire "on-your-feet" practice with techniques used by these companies as well as opportunities to converse with artists in the field. HU

*** THST 226b / MUSI 229b, Musical Theater Performance II** Staff

The collaborative process and its effect on musical theater performance. Choreography, music direction, and origination of new works. Analysis of texts, scripts, and taped or filmed performances; applications in students' own performance. May be repeated for credit. For audition information e-mail dan.egan@yale.edu. RP

*** THST 230b, Advanced Acting and Scene Study** Joan MacIntosh

Combination of exercises and scene study to deepen the understanding and playing of action. Admission by audition. Open to junior and senior Theater Studies majors only. May be taken more than once. Prerequisite: THST 211.

*** THST 235b / ART 235b, Dance Theater** Irene Hultman Monti

A studio-based introduction to movement vocabularies, physical techniques, and choreographic repertoire from post-1950 modern and postmodern dance theater to the present. Through a historical survey of major aesthetic shifts in dance, the course focuses on building the essential skills of a dance artist: the heightened awareness of time and space, the ability to read and translate diverse choreographic ideas, and the ability to question in motion. Open to students of all levels and majors. HU

*** THST 300a, The Director and the Text I** Toni Dorfman

Basic exercises in approaching dramatic or other literary texts from the director's perspective. Particular attention to the many roles and functions of the director in production. Rehearsal and production of workshop scenes. Open to junior and senior Theater Studies majors, and to nonmajors with permission of the instructor. Prerequisite: THST 210. HU RP

*** THST 308b, Performing Design** Nathan Roberts and Deborah Margolin

Exploration of the theatrical design and production process in a devised theater setting. Study and application of collaborative strategies of experimental theater groups (Living Theater, Split Britches) for the generation of design and production elements. Consideration of the elements that shape theatrical experiences; generative exercises leading to weekly design-performance pieces in response to textual, imagistic, and aural prompts; and technologies and techniques for adaptive, flexible design. Development of a devised theatrical work that culminates in a public performance.

*** THST 314a, Creation of a Musical: Rumspringa** Annette Jolles

Dramaturgy, production preparation, research, and exploration of a new musical theater piece, *Rumspringa*, by Scott Feiner and Walker Caplan, both Yale class of 2020. Course combines production specific research and rehearsal with new musical development. Parallel lines of inquiry merge in December 2019 performances in the Whitney Theater. Course intended for actors, designers, directors, music directors, producers, and dramaturgs. Permission of instructor. RP

*** THST 315a / ENGL 211a, Acting Shakespeare** James Bundy

A practicum in acting verse drama, focusing on tools to mine the printed text for given circumstances, character, objective, and action; noting the opportunities and limitations

that the printed play script presents; and promoting both the expressive freedom and responsibility of the actor as an interpretive and collaborative artist in rehearsal. The course will include work on sonnets, monologues, and scenes. Admission by audition. Preference to seniors and juniors; open to nonmajors. HU RP

* **THST 318b / MUSI 340b, Analyzing, Directing, and Performing Early Opera** Grant Herreid

Study of a seventeenth-century Venetian opera, with attention to structural analysis of text and music. Exploration of period performance practice, including rhetorical expression, musical style, gesture, dance, Italian elocution, and visual design. Production of the opera in conjunction with the Yale Baroque Opera Project. Open to all students, but designed especially for singers, instrumentalists, and directors. Admission by audition only. May be repeated for credit. For audition information e-mail grant.herreid@yale.edu. HU RP

* **THST 319a / AFAM 313a, Embodying Story** Renee Robinson

The intersection of storytelling and movement as seen through historical case studies, cross-disciplinary inquiry, and studio practice. Drawing on eclectic source materials from different artistic disciplines, ranging from the repertory of Alvin Ailey to journalism, architectural studies, cartoon animation, and creative processes, students develop the critical, creative, and technical skills through which to tell their own stories in movement. No prior dance experience necessary. HU

* **THST 320a / ENGL 453a, Playwriting** Donald Margulies

A seminar and workshop on reading for craft and writing for the stage. In addition to weekly prompts and exercises, readings include modern American and British plays by Pinter, Mamet, Churchill, Kushner, Nottage, Williams, Hansberry, Hwang, Vogel, and Wilder. Emphasis on play structure, character, and conflict. RP

* **THST 321a / ENGL 477a, Production Seminar: Playwriting** Deborah Margolin

A seminar and workshop in playwriting. Emphasis on developing an individual voice. Scenes read and critiqued in class. Admission by application, with priority to Theater Studies majors. A writing sample and statement of purpose should be submitted to the instructor before the first class meeting.

* **THST 322b / ENGL 481b, Advanced Playwriting** Deborah Margolin

A seminar and workshop in advanced playwriting that furthers the development of an individual voice. Study of contemporary and classical plays to understand new and traditional forms. Students write two drafts of an original one-act play or adaptation for critique in workshop sessions. Familiarity with basic playwriting tools is assumed. Open to juniors and seniors, nonmajors as well as majors, on the basis of their work; priority to Theater Studies majors. Writing samples should be submitted to the instructor before the first class meeting. Prerequisite: THST 320 or 321, or a college seminar in playwriting, or equivalent experience. RP

* **THST 335a / AFST 435a, West African Dance: Traditional to Contemporary** Lacina Coulibaly

A practical and theoretical study of the traditional dances of Africa, focusing on those of Burkina Faso and their contemporary manifestations. Emphasis on rhythm, kinesthetic form, and gestural expression. The fusion of modern European dance and traditional African dance. Admission by audition during the first class meeting. HU RP

* **THST 340a, Ballet Now** Daniel Ulbricht

A practical investigation of seminal ballets in the repertory of New York City Ballet. Tracing a sweeping history of artistic innovation from the early twentieth century to the present, this course covers the technique and aesthetic details that constitute New York City Ballet's style and follow the ways that these stylistic strengths are applied and transformed in the contemporary ballets of the 21st century. Repertory excerpts move through foundational works by George Balanchine and Jerome Robbins to ballets created in the past fifteen years by some of the most prominent ballet choreographers working today. Prior dance training required. Admission is by audition. HU

* **THST 358b, Introduction to Lighting Design** Alan Edwards

Exploration of the aesthetics and techniques of professional stage lighting. Priority to Theater Studies majors. RP

* **THST 395a / ART 389a, Postmodern Dance** Emily Coates

A studio-based exploration of the epochal shift in choreographic aesthetics known as postmodern dance. The social and historical context in which postmodern dance emerged, including the reconstruction of key dances from the 1960s and 1970s; the evolution of postmodern dance aesthetics into the twenty-first century. HU

* **THST 401a, Conceptual Sound Design for Theater** Nathan Roberts

Theoretical and practical considerations for conceptual sound design, the creation of aural content and imagery in support of dramatic action. The use of sound to communicate meaning and intention effectively in a theatrical setting. Auditory culture and the phenomenology of hearing; the role of technology in sound design; development of critical listening skills and of a foundational vocabulary for the medium. Projects focus on the generation of content and ideas in support of a text. HU

* **THST 412b, Libretto Writing for Musical Theater** Marsha Norman

Practical instruction in book writing for musical theater combined with close reading of historical and contemporary examples of the genre. Weekly exercises focus on issues of craft, creativity, and collaboration. RP

* **THST 414a, Lyric Writing for Musical Theater** Michael Korie

The craft of lyric writing in musical theater, opera, and crossover works. Both historical models and new composition used as objects of study. Analysis of song form and placement, and of lyric for character, tone, and diction. Creation of lyrics in context.

Limited enrollment. Interested students should write to dan.egan@yale.edu for application requirements. May not be repeated for credit. HU RP

* **THST 427a or b / AMST 349a or b, Technologies of Movement Research** Emily Coates

An interdisciplinary survey of creative and critical methods for researching human movement. Based in the motion capture studio at the Center for Collaborative Arts and Media, the course draws movement exercises and motion capture experiments together with literature from dance and performance studies, art, anthropology, sociology, philosophy, cognitive science, and the history of science to investigate the ways that artists and scholars conceive of human movement as a way of knowing the world. Students will develop their own projects over the course of the semester. No prior experience in dance required.

* **THST 437a / ER&M 437a, Performance behind Bars: Sacred Music, Sacred Texts, and Social Justice** Ronald Jenkins

Through the study of theatrical works that have been adapted from sacred texts, the course introduces students to playwriting techniques helpful for writing their own scripts based on a socially conscious reading of sacred texts. Possible collaboration with incarcerated and formerly incarcerated individuals in adapting Dante's *Divine Comedy* for the stage. HU

Special Projects

* **THST 471a, Directed Independent Study** Staff

An independent study should generally conform to the standards and procedures of the senior project, THST 491, even when not undertaken by a senior. If the independent study is a performance or directing project, the adviser visits rehearsals and performances at the mutual convenience of adviser and student. The project must be accompanied by an essay of about fifteen pages, worth about half the final grade. Although the paper's requirements vary with the project and its adviser, it must be more than a rehearsal log. The paper typically engages interpretative and performance issues as revealed in other productions of the work (if they exist). The writing should be concomitant with rehearsal, to enable each to inform the other, and a draft must be presented to, and commented on by, the adviser at least a week before – not after – the final performance. The final version of the paper, incorporating adjustments and reflections, should be turned in to the adviser no later than ten days after the performance closes, and no later than the first day of the final examination period. An essay project entails substantial reading, at least four meetings with the adviser, and a paper or papers totaling at least twenty pages. A playwriting project normally requires twenty new script pages every two weeks of the term and regular meetings with the adviser. A final draft of the entire script is the culmination of the term's work. Application forms are available from the director of undergraduate studies. Juniors may use one term of these courses to prepare for their senior projects. Open to juniors and seniors. Prerequisites: THST 210 and one seminar.

* **THST 491a or b, Senior Project in Theater Studies** Nathan Roberts and Daniel Egan

Students must submit proposals for senior projects to the Theater Studies office by the deadline announced by the director of undergraduate studies. Attendance at weekly section meetings is required for all students undertaking production projects. Application forms are available in the Theater Studies office, 220 York St.

Urban Studies

Director of undergraduate studies: Joyce Hsiang (joyce.hsiang@yale.edu), 327 RDH, 432-2288

Urban Studies is an interdisciplinary field grounded in the physical and social spaces of the city and the larger built environment. The Urban Studies major is situated within Yale's liberal arts framework and draws on the broader academic context and expertise of the Yale School of Architecture, including the areas of urban design and development, urban and architectural history, urban theory and representation, globalization and infrastructure, transportation and mobility, heritage and preservation, and community-based planning. The major introduces students to the following bodies of knowledge: history, theory and contemporary analysis of urban morphologies, spaces, societies, and political economies; conceptual tools and analytical methods to understand urban environments and issues through spatial terms; and practices of and speculative approaches to urban planning and design.

The major prepares undergraduates for a variety of future careers and fields of graduate study related to urban planning, design, and development. These include professional and practice-oriented fields such as urban planning, law, non-profit management, public policy, real estate development, and architecture; as well as research-oriented fields such as geography, sociology, anthropology, urban planning, and architecture.

REQUIREMENTS OF THE MAJOR

Students in the Class of 2020 and 2021 Students interested in pursuing a major in Urban Studies should consult with the director of undergraduate studies (DUS) early in the fall 2019 term. Upon approved fulfillment of the requirements indicated below, upper-level students may earn a B.A. degree in Urban Studies.

Students in the Class of 2022 and subsequent classes Students majoring in Urban Studies must take thirteen course credits approved by the DUS. The major is organized around survey courses, methods courses, related electives, and a one- or-two term senior requirement.

Thirteen term courses are required for the major, including the senior requirement. Each student, in consultation with the director of undergraduate studies (DUS) or a departmental faculty adviser, bears the responsibility for designing a coherent program, which must include the following elements: 3 surveys, 3 methods courses, 4 or 6 electives, depending on the senior requirement; and a one- or two-term senior requirement. All students are required to take either ARCH 360 or 362, one of the Urban Lab courses.

Surveys Students choose three survey courses from the following list, of which one course in ARCH is required. Surveys should be completed by the end of the second year.

Surveys: ARCH 200, ARCH 280, ARCH 341, ARCH 385, AMST 196, ANTH 414, EVST 226, HSHM 211

Methods Courses Students choose either ARCH 360 or 362 (Urban Labs) as one of the three required courses from the following list that introduces various methods

of understanding and analyzing urbanism and the city. Students should consider completing at least two of these courses by the end of their junior year.

Methods Courses: ARCH 230, 345, 353, 360, 362, AMST 348, ANTH 303, EVST 290, HSHM 422, SOCY 160

Electives Students choose five electives if enrolling in the two-term senior requirement; 6 electives if opting for the one-term senior requirement. Each student is responsible for selecting their elective courses from the approved list available on the Urban Studies website or by petition of the DUS. Students who take two Urban Labs (1.5 credits each) may take 4 electives.

Credit/D/Fail No course taken Credit/D/Fail may be counted toward the Urban Studies major.

SENIOR REQUIREMENT

All majors must satisfy a senior requirement undertaken during the senior year. Students have the option of pursuing a yearlong senior project, which includes the ARCH 490, Senior Research Colloquium in the fall and URBN 491, Senior Project in the spring. The senior project may be a written paper or a project that could encompass a variety of media. The primary adviser must be a member of the architecture faculty. Students not choosing a yearlong project may enroll in an advanced seminar (ARCH 400–490), and produce a final paper of twenty to twenty-five pages in addition to existing course work. The seminar should be selected in consultation with the DUS. Note that students pursuing this option must also take an additional elective.

ADVISING AND INTENT TO MAJOR

Students may declare their intent to major during their second year. The intent to major process will include meeting with the DUS to discuss the intended course of study; submitting a Declaration of Intent to Major form and completing the surveys by the end of the second year. More information regarding this process, the relevant forms, and submission link is available on the program's website. Schedules for majors must be discussed with, and approved by, the DUS in Urban Studies. Only then may a schedule be submitted to the residential college dean's office.

Courses in the School of Architecture Unless otherwise indicated in the course descriptions, all courses in the School of Architecture are open to majors and nonmajors with permission of the instructor and the graduate registrar. They are not available for the Credit/D/Fail option. Students are admitted on the basis of their previous course work and previous performance.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 13 courses (incl senior req)

Specific courses required ARCH 360 or ARCH 362

Distribution of courses 3 surveys, inc 1 ARCH course (to be completed by second year); 3 methods courses, one of which is ARCH 360 or 362; 4–6 electives as specified

Senior Requirement ARCH 490 and URBN 491; or adv seminar (ARCH 400–490) and addt elective

FACULTY ASSOCIATED WITH URBAN STUDIES

Professors Keller Easterling (*School of Architecture*), Alexander Garvin (*Adjunct*)(*School of Architecture*), Jennifer Klein (*History*), Alan Plattus (*School of Architecture*), Helen Siu (*Anthropology*)

Associate Professors Laura Barraclough (*American Studies*), Erik Harms (*Anthropology*), Bill Rankin (*History of Science, Medicine, and Public Health*), Elihu Rubin (*School of Architecture, American Studies*)

Assistant Professors Anthony Acciavati (*visiting*) (*School of Architecture*), Joyce Hsiang (*School of Architecture*), Albert Laguna (*American Studies*), Bimal Mendis (*Adjunct*) (*School of Architecture*), Elihu Rubin (*School of Architecture*)

Lecturers Riché Barnes (*Anthropology*), Alexander Garvin (*School of Architecture*), Jay Gitlin (*History*)

Critics Marta Caldeira (*School of Architecture*), Andrei Harwell (*School of Architecture*), Surry Schlabs (*School of Architecture*)

Courses

* **ARCH 491b / URBN 491, Senior Project** Marta Caldeira

An essay or project in the student's area of concentration. Students in the history, theory, and criticism track or in the urban studies track pursue independent research with an adviser; this project must terminate in a senior essay.

Women's, Gender, and Sexuality Studies

Director of undergraduate studies: Andrew Dowe (andrew.dowe@yale.edu); wgss.yale.edu

Genders and sexualities are powerful organizing forces: they shape identities and institutions, nations and economies, cultures and political systems. Careful study of gender and sexuality thus explains crucial aspects of our everyday lives on both intimate and global scales. Scholarship in Women's, Gender, and Sexuality Studies is interdisciplinary and wide ranging, drawing on history, literature, cultural studies, social sciences, and natural science to study genders and sexualities as they intersect with race, ethnicity, class, nationality, transnational processes, disability, and religion.

Students majoring in Women's, Gender, and Sexuality Studies take a series of core courses, develop an individual area of concentration, and write a yearlong or single-term senior essay. The program encourages work that is interdisciplinary, intersectional, international, and transnational. Individual concentrations evolve along with students' intellectual growth and academic expertise. Recent examples of concentrations include literature and queer aesthetics; transnational feminist practices; the intellectual history of civil rights activism; AIDS health policies; gender, religion, and international NGOs; women's health; food, sexuality, and lesbian community; and gender and sexuality in early education.

REQUIREMENTS OF THE MAJOR

The major for the Class of 2020 With approval from the director of undergraduate studies (DUS), the following changes to the requirements of the major may be fulfilled by students who declared their major under previous requirements.

The major for the Class of 2021 and subsequent classes Twelve term courses are required and this major may be taken either as a primary major or as one of two majors. Requirements include two intermediate courses selected from WGSS 205, 206, 207, or 340. Majors are strongly encouraged to take these intermediate courses during their first two years. The major also requires two methodology courses, five courses in an area of concentration, the junior research seminar (WGSS 398), and a two-course senior requirement. The area of concentration consists of at least five courses, the majority of which should be drawn from program offerings. Substitutions to the major requirements may be made only with the written permission of the DUS.

Methodology courses Given its interdisciplinary nature, Women's, Gender, and Sexuality Studies necessarily relies on a wide range of methodologies: literary criticism, ethnography, visual analysis, historiography, and quantitative data analysis, among others. Each student is expected to acquire competence in at least two methodologies relevant to their own concentration and planned senior essay. Students are advised to take the first of these courses during their first two years and to complete the two-course methods requirement in the junior year, in preparation for the senior essay.

Junior research seminar All students in the major must take WGSS 398, Junior Research Seminar, which provides majors opportunity to examine, synthesize and apply the interdisciplinary theory and methods to which they have been exposed while completing the intermediate course sequence and methodology requirement.

(Individualized alternatives are found for students who study abroad during the junior year.)

SENIOR REQUIREMENT

The yearlong senior essay The two-term senior sequence consists of WGSS 490, Senior Colloquium, in which students begin researching and writing a senior essay, followed by WGSS 491, Senior Essay, in which students complete the essay. The senior essay is developed and written under the guidance and supervision of a WGSS-affiliated faculty member with expertise in the area of concentration. Students are expected to meet with their essay advisers on a regular basis.

The single-term senior essay Majors may opt to complete the senior essay requirement in an approved upper-level WGSS seminar in the fall or spring term, with the approval of the instructor, by writing a senior essay of twenty-five to forty-five pages in lieu of the course's normal writing requirements. Students who choose the single-term senior essay take one additional WGSS course of their choosing to fulfill the twelve-term-course requirement.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 12 term courses (incl senior requirement)

Specific courses required WGSS 398

Distribution of courses 2 intermediate courses; 2 methodology courses; 5 electives in area of concentration

Senior requirement Senior colloquium and senior essay (WGSS 490, 491); or single-term senior essay in an upper-level seminar and one additional elective

FACULTY ASSOCIATED WITH THE PROGRAM OF WOMEN'S, GENDER, AND SEXUALITY STUDIES

Professors Roderick Ferguson (*Chair, Spring*), Inderpal Grewal (*American Studies*), Margaret Homans (*Chair, Fall*) (*English*), Marianne LaFrance (*Psychology*), Laura Wexler (*American Studies*), Ana Ramos-Zayas (*American Studies, Ethnicity, Race & Migration*)

Associate Professors Joseph Fischel, Susan Stryker (*Visiting*)

Assistant Professors Eda Pepi, Evren Savci

Senior Lecturers Maria Trumpler

Lecturers Melanie Boyd, Andrew Dowe, Graeme Reid

Affiliated Faculty Julia Adams (*Sociology*), Rene Almeling (*Sociology*), Carol Armstrong (*History of Art*), Daniel Botsman (*History*), Claire Bownern (*Linguistics*), Marijeta Bozovic (*Slavic Languages & Literatures*), Rosie Bsheer (*History*), Jill Campbell (*English*), Hazel Carby (*African American Studies, American Studies*), Kang-i Sun Chang (*East Asian Languages & Literatures*), Becky Conekin (*History*), Deborah Davis (*Sociology, East Asian Studies*), Rohit De (*History*), Igor De Souza (*English, Humanities*), Carolyn Dean (*History, French*), Ziv Eisenberg (*History*), Ron Eyeran (*Sociology*), Crystal Feimster (*African American Studies*), Marta Figlerowicz (*Comparative Literature, English*), Moira Fradinger (*Comparative Literature*), Glenda Gilmore (*Emeritus*) (*History*), Jacqueline Goldsby (*African American Studies, American Studies, English*),

Gregg Gonsalves (*Law School, Public Health*), Zareena Grewal (*American Studies, Religious Studies*), Dolores Hayden (*Emeritus*) (*School of Architecture, American Studies*), Janet Henrich (*School of Medicine*), Marcia Inhorn (*Anthropology, Global Affairs*), Alice Kaplan (*French*), Jennifer Klein (*History*), Greta LaFleur (*American Studies*), He#le#ne Landmore-Jelaca (*Political Science*), Kathryn Lofton (*American Studies, History, Religious Studies*), Mary Lui (*American Studies, History*), Karuna Mantena (*Political Science*), Deb Margolin (*Adjunct*) (*Theater Studies*), Kobena Mercer (*History of Art, African American Studies*), Joanne Meyerowitz (*American Studies, History*), Alice Miller (*Law School, Public Health*), Elise Morrison (*Theater Studies*), Tavia Nyong'o (*Theater Studies, American Studies*), John Pachankis (*Public Health*), Sally Promey (*American Studies, Institute of Sacred Music*), Judith Resnik (*Law School*), Jill Richards (*English*), Naomi Rogers (*History, History of Science, Medicine & Public Health*), Frances Rosenbluth (*Political Science*), Alicia Schmidt Camacho (*American Studies, Ethnicity, Race & Migration*), William Summers (*Emeritus*) (*Molecular, Cellular, & Developmental Biology, History of Science, Medicine, & Public Health*), George Syrimis (*Hellenic Studies*), Rebecca Tannenbaum (*History*), Linn Tonstad (*Divinity School*), Jing Tsu (*East Asian Languages & Literatures, Comparative Literature*), Claudia Valeggia (*Anthropology*), Noel Valis (*Spanish & Portuguese*), Michael Warner (*English, American Studies*), Elisabeth Wood (*Political Science*)

First-Year Seminars

* WGSS 030a, Neoliberalism and Sexuality Evren Savci

Sexuality is often imagined as a private and intimate affair, experienced individually, marked by personal histories and preferences. This course argues otherwise. Specifically, we consider the intersections between the current dominant political economic mode, referred to as neoliberal capitalism, and sexuality as a field of power. We analyze how subjectivities are formed under this current system, how desires are produced and discourses incited, and how the particular *moralization* of economic behavior has implications for a range of issues including reproductive justice, definitions of kinship, sexual liberation movements, and contemporary states of war and emergency. Thinking of sexuality as a field of power that is predicated on notions of normality and abnormality enables us to see what other “undesirable” subjects are produced under conditions of neoliberal capitalist modernity with whom sexual others are always in kinship. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. SO

* WGSS 032b, History of Sexuality Maria Trumpler

Exploration of scientific and medical writings on sexuality over the past century. Focus on the tension between nature and culture in shaping theories, the construction of heterosexuality and homosexuality, the role of scientific studies in moral discourse, and the rise of sexology as a scientific discipline. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

Gateway Courses

* WGSS 222b / AMST 206b / ER&M 221b, Introduction to Critical Refugee Studies Quan Tran

Reconfiguring refugees as fluid subjects and sites of social, political, and cultural critiques. Departing from dominant understandings of refugees as victims,

consideration instead of refugees as complex historical actors, made visible through processes of colonization, imperialism, war, displacement, state violence, and globalization, as well as ethical, social, legal, and political transformations. Focus on second-half of the twentieth century. SO

Intermediate Courses

* **WGSS 205a, Bodies and Pleasures, Sex and Genders** Joseph Fischel

This seminar engages cultural analyses of embodiment, its pleasures—and by extension its pains—to interrogate sex, sexuality, and gender as analytical categories. Its aim is to critically evaluate formative concepts and theories that have been subject to debates within gender studies, psychoanalysis, philosophy, anthropology, critical race studies, and history. Readings by Freud, Foucault, Berlant, Butler, Rubin, and others help explain how terms like “women” and “men,” “femininity” and “masculinity,” as well as “homosexuality” and “heterosexuality,” “gender” and “transgender” have structured people’s experiences and their perceptions of their bodies. The potential our bodies have for “hanging on to ourselves” occupies a central position within scholarly canons, revealing also how these canons are always already imbricated in racialized hierarchies. SO

* **WGSS 206b, Transnational Approaches to Gender & Sexuality** Evren Savci

Examination of transnational debates about gender and sexuality as they unfold in specific contexts. Gender as a category that can or cannot travel; feminist critiques of liberal rights paradigms; globalization of particular models of gender/queer advocacy; the role of NGOs in global debates about gender and sexuality. WR

WGSS 207b, Gender, Justice, Power, Institutions Joseph Fischel

Examination of how inequalities based on gender, race, caste, class, sexuality as well as a host of other identities are embedded in institutions that make up our social world. From the family and the home to the workplace, from the University, and the Corporation, to the Military and Media, we track how inequalities emerge and are sustained by power and institutional structures. We also see how they are challenged and what sorts of instruments are needed to challenge them. In particular, we focus on sexual politics and sexual violence as a key issue to understanding the gendered workings of institutions, in order to examine structures that sustain inequality. Through the semester, we hope to consider many domains of life—bedrooms and boardrooms, international borders and feminist movements—to understand the stubborn and sticky forms and hierarchies of power that are challenged and contested by activists, scholars, and communities. TR

Junior Seminars

* **WGSS 398a, Junior Research Seminar** Andrew Dowe

An interdisciplinary approach to studying gender and sexuality. Exploration of a range of relevant theoretical frameworks and methodologies. Prepares students for the senior essay. WR, SO

Senior Courses

* **WGSS 490a or b, The Senior Colloquium** Andrew Dowe

A research seminar taken during the senior year. Students with diverse research interests and experience discuss common problems and tactics in doing independent research.

* **WGSS 491a or b, The Senior Essay** Andrew Dowe

Independent research on, and writing of, the senior essay.

Electives

* **WGSS 033a / HIST 033a, Fashion in London and Paris, 1750 to the Present** Becky Conekin

Introduction to the history of Western fashion from the mid-eighteenth century to the present, with a focus on Paris and London. Approaches, methods, and theories scholars have historically employed to study fashion and dress. Enrollment limited to first-year students. Preregistration required; see under First-Year Seminar Program. WR, HU

* **WGSS 179a / ENGL 219a / HUMS 149a / ITAL 309a / LITR 179a, Gender and Genre in Renaissance Love Poetry** Ayesha Ramachandran

Introduction to the poetic genres of lyric, epic, and pastoral in the European Renaissance. Focus on questions of desire, love, and gendered subjectivity. The historical contexts and political uses of discourses of eroticism and pleasure in Italy, Spain, France, and England. Written exercises include poetic imitations of Renaissance texts. HU

WGSS 207b, Gender, Justice, Power, Institutions Joseph Fischel

Examination of how inequalities based on gender, race, caste, class, sexuality as well as a host of other identities are embedded in institutions that make up our social world. From the family and the home to the workplace, from the University, and the Corporation, to the Military and Media, we track how inequalities emerge and are sustained by power and institutional structures. We also see how they are challenged and what sorts of instruments are needed to challenge them. In particular, we focus on sexual politics and sexual violence as a key issue to understanding the gendered workings of institutions, in order to examine structures that sustain inequality. Through the semester, we hope to consider many domains of life—bedrooms and boardrooms, international borders and feminist movements—to understand the stubborn and sticky forms and hierarchies of power that are challenged and contested by activists, scholars, and communities. TR

* **WGSS 209a / CLCV 216a / LITR 239a / MGRK 216a, Dionysus in Modernity**
George Syrimis

Modernity's fascination with the myth of Dionysus. Questions of agency, identity and community, and psychological integrity and the modern constitution of the self. Manifestations of Dionysus in literature, anthropology, and music; the Apollonian-Dionysiac dichotomy; twentieth-century variations of these themes in psychoanalysis, surrealism, and magical realism. HU

WGSS 219a / AFAM 231a or b / ANTH 211a or b / WGSS 436b, Sex and Gender in the Black Diaspora Riché Barnes

A critical survey of images, rhetorics, experiences, and practices of gender and sexuality formation of black subjects in Africa, the Caribbean, western Europe, and the United States. Construction of class, nationality, race, color, sexuality, and gender. SO

* **WGSS 220a / PLSC 220a / PLSC S220, Gender Politics** Andrea Aldrich

Exploration of theoretical and empirical work in political science to study the relationship between gender and politics in the United States and around the world. Topics include women's representative in legislative and executive branch politics in democratic regimes; the impact of gender stereotypes on elections and public opinion; conditions that impact the supply and demand of candidates across genders; and the underrepresentation of women in political institutions. WR, SO

* **WGSS 245a / FILM 243a / MGRK 218a, Family in Greek Literature and Film** George Syrimis

The structure and multiple appropriations of the family unit, with a focus on the Greek tradition. The influence of aesthetic forms, including folk literature, short stories, novels, and film, and of political ideologies such as nationalism, Marxism, and totalitarianism. Issues related to gender, sibling rivalry, dowries and other economic factors, political allegories, feminism, and sexual and social violence both within and beyond the family. WR, HU TR

* **WGSS 251a / ENGL 251a, Experiments in the Novel: The Eighteenth Century** Jill Campbell

The course provides an introduction to English-language novels of the long eighteenth century (1688–1818), the period in which the novel has traditionally been understood to have "risen." Emphasizing the experimental nature of novel-writing in this early period of its history, the course foregrounds persistent questions about the genre as well as a literary-historical survey: What is the status of fictional characters? How does narrative sequence impart political or moral implications? How do conventions of the novel form shape our experience of gender? What kind of being is a narrator? Likely authors include Aphra Behn, Daniel Defoe, Samuel Richardson, Henry Fielding, Laurence Sterne, Maria Edgeworth, Jane Austen, Jennifer Egan, Colson Whitehead, and Richard Powers. WR, HU

* **WGSS 260a, Food, Identity and Desire** Maria Trumpler

Exploration of how food—ingredients, cooking practices, and appetites—can intersect with gender, ethnicity, class, and national origin to produce profound experiences of identity and desire. Sources include memoir, cookbooks, movies, and fiction.

WGSS 282b / HSAR 282b / HSHM 237b, Renaissance Bodies: Art, Magic, Science Marisa Bass

An introduction to issues surrounding the representation of the body in both art and science, spanning from the late Middle Ages to the seventeenth century, and with a particular focus on the Northern Renaissance. Topics include medicine, reproduction, witchcraft, the gender spectrum, torture, race, disability, desire, dreams, and theories of imagination and invention. Sections and assignments will make ample use of the Yale collections. Previous experience with art history welcome but not required. HU

*** WGSS 293b / CLCV 319b / HIST 242Jb / MGRK 300b, The Olympic Games, Ancient and Modern** George Syrimis

Introduction to the history of the Olympic Games from antiquity to the present. The mythology of athletic events in ancient Greece and the ritual, political, and social ramifications of the actual competitions. The revival of the modern Olympic movement in 1896, the political investment of the Greek state at the time, and specific games as they illustrate the convergence of athletic cultures and sociopolitical transformations in the twentieth century. HU

*** WGSS 347b / HIST 455Jb / HUMS 287b, The Theory and Practice of Resistance** Terence Renaud

Exploration of the histories and theories of resistance in the modern world. How liberation movements, guerrillas, and oppressed groups appeal to resistance as an organizational strategy and as moral justification. Readings include Kant, Thoreau, Nietzsche, Luxemburg, Lenin, Gandhi, Fanon, Arendt, Marcuse, Foucault, A. Lorde, Said, and J. Butler. Themes include antifascism to terrorism; violence to nonviolence, the New Left to Black Lives Matter. HU

*** WGSS 354a / HIST 191Ja, Women, Gender, and Grassroots Politics in the United States after World War II** Jennifer Klein

American politics and grassroots social movements from 1945 to the present explored through women's activism and through gender politics more broadly. Ideas about gender identities, gender roles, and family in the shaping of social movements; strategies used on the local, regional, national, and international levels. Connections between organizing and policy, public and private, state and family, and migration, immigration, and empire. WR, HU

*** WGSS 372b, Theory and Politics of Sexual Consent** Joseph Fischel

Political, legal, and feminist theory and critiques of the concept of sexual consent. Topics such as sex work, nonnormative sex, and sex across age differences explored through film, autobiography, literature, queer commentary, and legal theory. U.S. and Connecticut legal cases regarding sexual violence and assault. SO

*** WGSS 378b / ANTH 381b, Sex and Global Politics** Graeme Reid

Global perspectives on the sexual politics of gender identity, sexual orientation, and human rights. Examination of historical, cultural, and political aspects of sexual orientation and gender identity in the context of globalization. SO

*** WGSS 387b, Gender, Sexuality, and Islam** Evren Savci

The use of critical texts that span a wide range of disciplines to examine gender and sexuality in the context of predominantly Muslim countries and cultures, as well as the larger transnational discourses that shape the ways in which Islam is imagined in relationship to gender and sexuality. By putting gender and sexuality at the center of our analysis, we are able to tease out the complex relationships between religion, culture, nation-states, and racialization, and think about how particular constructions of gender and sexuality have been central to the production and reproduction of each of these social structures. A critical knowledge of Orientalism, colonialism, and global inequalities is crucial for a careful and nuanced understanding of the different roles gender and sexuality have played, and continue to play in representations of Islam, and Muslims. This also underlines the current place of Islam not only as a world religion, or a set of beliefs and practices, but also as a "signifier." Students develop a historical

understanding of many contemporary discussions around Islam and what gets referred to as "Muslim cultures" and should be able to critically engage with and complicate the terms and issues such as "cultural difference," "women's and LGBT rights," and "modernity/civilization" that are widely and easily deployed in current political and moral discourses around the Middle East and Islam.

WGSS 405a / EALL 211a / EAST 241a / LITR 174a, Women and Literature in Traditional China Kang-i Sun Chang

A study of major women writers in traditional China, as well as representations of women by male authors. The power of women's writing; women and material culture; women in exile; courtesans; Taoist and Buddhist nuns; widow poets; cross-dressing women; the female body and its metaphors; footbinding; notions of love and death; the aesthetics of illness; women and revolution; poetry clubs; the function of memory in women's literature; problems of gender and genre. All readings in translation; no knowledge of Chinese required. Some Chinese texts provided for students who read Chinese. Formerly CHNS 201. HU TR

* **WGSS 408a / AMST 345a / ER&M 409a, Latinx Ethnography** Ana Ramos-Zayas
Consideration of ethnography within the genealogy and intellectual traditions of Latinx Studies. Topics include: questions of knowledge production and epistemological traditions in Latin America and U.S. Latino communities; conceptions of migration, transnationalism, and space; perspectives on "(il)legality" and criminalization; labor, wealth, and class identities; contextual understandings of gender and sexuality; theorizations of affect and intimate lives; and the politics of race and inequality under white liberalism and conservatism in the United States. SO

* **WGSS 409a / AMST 410a / HIST 166Ja, Asian American Women and Gender, 1830 to the Present** Mary Lui

Asian American women as key historical actors. Gender analysis is used to reexamine themes in Asian American history: immigration, labor, community, cultural representations, political organizing, sexuality, and marriage and family life. WR, HU

* **WGSS 410b / AFAM 410b / AMST 310b, Interdisciplinary Approaches to African American Studies** Crystal Feimster

An interdisciplinary, thematic approach to the study of race, nation, and ethnicity in the African diaspora. Topics include class, gender, color, and sexuality; the dynamics of reform, Pan-Africanism, neocolonialism, and contemporary black nationalism. Use of a broad range of methodologies. WR, HU, SO

* **WGSS 419b / HIST 419Jb / HSHM 433b, Gender and Science** Deborah Coen

Exploration of the dual potential of the sciences to reinforce received ideas about gender or to challenge existing sexual and racial hierarchies; the rise of the ideas and institutions of the modern sciences as they have reflected and shaped new notions of femininity and masculinity.

WGSS 429a / PLSC 427a, Sex, Markets, and Power Frances Rosenbluth

Consideration of how women's socioeconomic status and political power have varied across time and place. Three analytical lenses are used: biology, markets, and power. SO

* **WGSS 431b / ANTH 451b, Intersectionality and Women's Health** Marcia Inhorn
The intersections of race, class, gender, and other axes of "difference" and their effects on women's health, primarily in the contemporary United States. Recent feminist

approaches to intersectionality and multiplicity of oppressions theory. Ways in which anthropologists studying women's health issues have contributed to social and feminist theory at the intersections of race, class, and gender. so

*** WGSS 463a / AMST 462a / ER&M 462a, The Study of Privilege in the Americas**

Ana Ramos-Zayas

Examination of inequality, not only through experiences of the poor and marginal, but also through institutions, beliefs, social norms, and everyday practices of the privileged. Topics include: critical examination of key concepts like "studying up," "elite," and "privilege," as well as variations in forms of capital; institutional sites of privilege (elite prep schools, Wall Street); living spaces and social networks (gated communities, private clubs); privilege in intersectional contexts (privilege and race, class, and gender); and everyday practices of intimacy and affect that characterize, solidify, and promote privilege. so

THE WORK OF YALE UNIVERSITY

The work of Yale University is carried on in the following schools:

Yale College Est. 1701. Courses in humanities, social sciences, natural sciences, mathematical and computer sciences, and engineering. Bachelor of Arts (B.A.), Bachelor of Science (B.S.). 203 432-9300 <https://admissions.yale.edu>

Graduate School of Arts and Sciences Est. 1847. Courses for college graduates. Master of Advanced Study (M.A.S.), Master of Arts (M.A.), Master of Science (M.S.), Master of Philosophy (M.Phil.), Doctor of Philosophy (Ph.D.). 203 432-2771 <https://gsas.yale.edu>

School of Medicine Est. 1810. Courses for college graduates and students who have completed requisite training in approved institutions. Doctor of Medicine (M.D.). Postgraduate study in the basic sciences and clinical subjects. Five-year combined program leading to Doctor of Medicine and Master of Health Science (M.D./M.H.S.). Combined program with the Graduate School of Arts and Sciences leading to Doctor of Medicine and Doctor of Philosophy (M.D./Ph.D.). Master of Medical Science (M.M.Sc.) from the Physician Associate Program and the Physician Assistant Online Program. 203 785-2643 <https://medicine.yale.edu/education/admissions>

Divinity School Est. 1822. Courses for college graduates. Master of Divinity (M.Div.), Master of Arts in Religion (M.A.R.). Individuals with an M.Div. degree may apply for the program leading to the degree of Master of Sacred Theology (S.T.M.). 203 432-5360 <https://divinity.yale.edu>

Law School Est. 1824. Courses for college graduates. Juris Doctor (J.D.). Graduate Programs: Master of Laws (LL.M.), Doctor of the Science of Law (J.S.D.), Master of Studies in Law (M.S.L.). Doctor of Philosophy (Ph.D.) awarded by the Graduate School of Arts and Sciences. 203 432-4995 <https://law.yale.edu>

School of Engineering & Applied Science Est. 1852. Courses for college graduates. Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) awarded by the Graduate School of Arts and Sciences. 203 432-4252 <https://seas.yale.edu>

School of Art Est. 1869. Professional courses for college and art school graduates. Master of Fine Arts (M.F.A.). 203 432-2600 <http://art.yale.edu>

School of Music Est. 1894. Graduate professional studies in performance, composition, and conducting. Certificate in Performance, Master of Music (M.M.), Master of Musical Arts (M.M.A.), Artist Diploma (A.D.), Doctor of Musical Arts (D.M.A.). 203 432-4155 <https://music.yale.edu>

School of Forestry & Environmental Studies Est. 1900. Courses for college graduates. Master of Forestry (M.F.), Master of Forest Science (M.F.S.), Master of Environmental Science (M.E.Sc.), Master of Environmental Management (M.E.M.). Doctor of Philosophy (Ph.D.) awarded by the Graduate School of Arts and Sciences. 800 825-0330 <https://environment.yale.edu>

School of Public Health Est. 1915. Courses for college graduates. Master of Public Health (M.P.H.), Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) awarded by the Graduate School of Arts and Sciences. 203 785-2844 <https://publichealth.yale.edu>

School of Architecture Est. 1916. Courses for college graduates. Professional and post-professional degree: Master of Architecture (M.Arch.); nonprofessional degree: Master of Environmental Design (M.E.D.). Doctor of Philosophy (Ph.D.) awarded by the Graduate School of Arts and Sciences. 203 432-2296 <https://architecture.yale.edu>

School of Nursing Est. 1923. Courses for college graduates. Master of Science in Nursing (M.S.N.), Post Master's Certificate, Doctor of Nursing Practice (D.N.P.), Doctor of Philosophy (Ph.D.) awarded by the Graduate School of Arts and Sciences. 203 785-2389 <https://nursing.yale.edu>

School of Drama Est. 1925. Courses for college graduates and certificate students. Master of Fine Arts (M.F.A.), Certificate in Drama, Doctor of Fine Arts (D.F.A.). 203 432-1507 <https://drama.yale.edu>

School of Management Est. 1976. Courses for college graduates. Master of Business Administration (M.B.A.), Master of Advanced Management (M.A.M.), Master of Management Studies (M.M.S.). Doctor of Philosophy (Ph.D.) awarded by the Graduate School of Arts and Sciences. <https://som.yale.edu>

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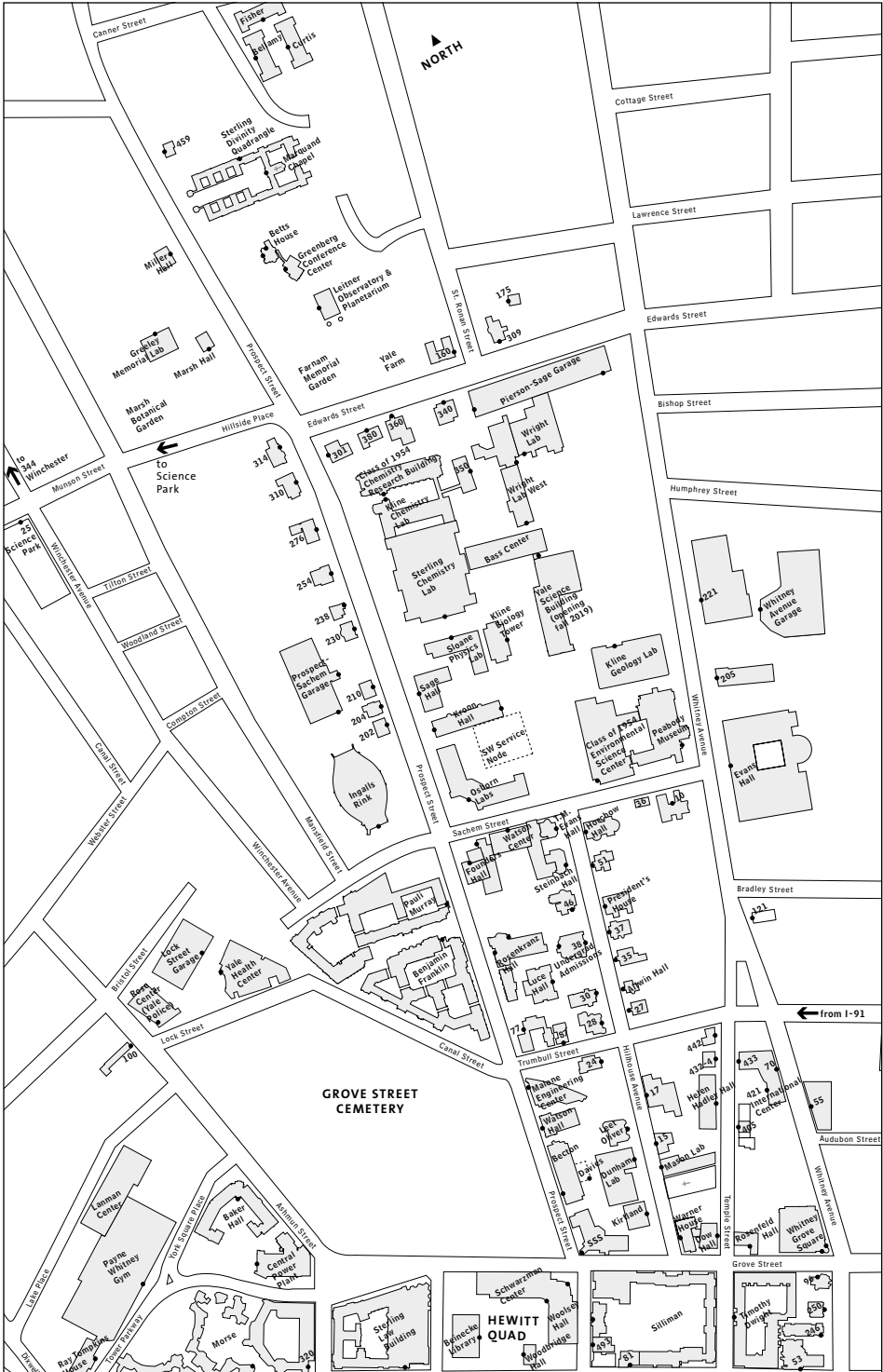
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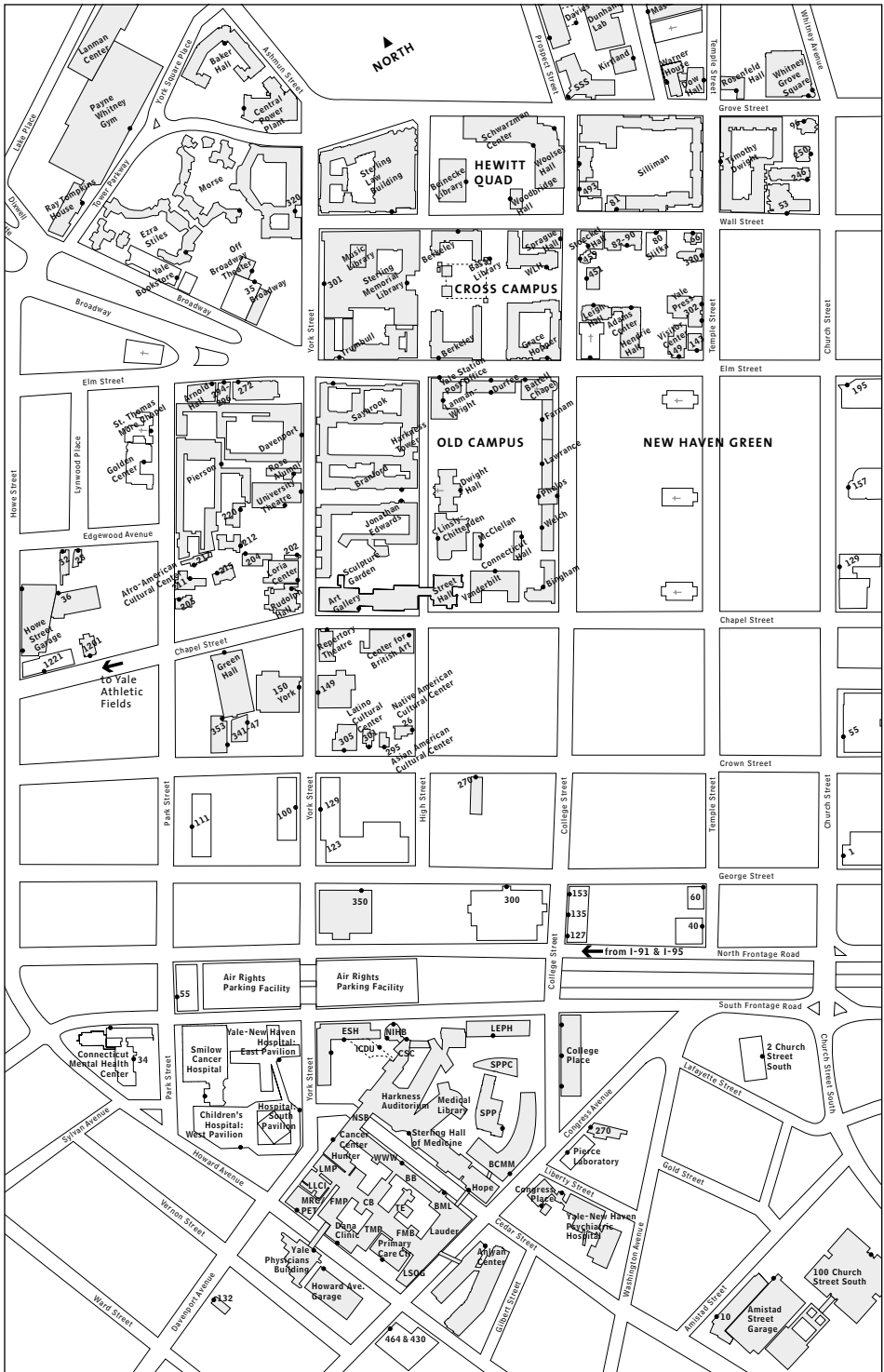
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YALE UNIVERSITY CAMPUS NORTH



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YALE UNIVERSITY CAMPUS SOUTH & YALE MEDICAL CENTER



The University is committed to basing judgments concerning the admission, education, and employment of individuals upon their qualifications and abilities and affirmatively seeks to attract to its faculty, staff, and student body qualified persons of diverse backgrounds. In accordance with this policy and as delineated by federal and Connecticut law, Yale does not discriminate in admissions, educational programs, or employment against any individual on account of that individual's sex, race, color, religion, age, disability, status as a protected veteran, or national or ethnic origin; nor does Yale discriminate on the basis of sexual orientation or gender identity or expression.

University policy is committed to affirmative action under law in employment of women, minority group members, individuals with disabilities, and protected veterans.

Inquiries concerning these policies may be referred to Valarie Stanley, Director of the Office for Equal Opportunity Programs, 221 Whitney Avenue, 4th Floor, 203.432.0849. For additional information, see <https://equalopportunity.yale.edu>.

Title IX of the Education Amendments of 1972 protects people from sex discrimination in educational programs and activities at institutions that receive federal financial assistance. Questions regarding Title IX may be referred to the University's Title IX Coordinator, Stephanie Spangler, at 203.432.4446 or at titleix@yale.edu, or to the U.S. Department of Education, Office for Civil Rights, 8th Floor, 5 Post Office Square, Boston MA 02109-3921; tel. 617.289.0111, fax 617.289.0150, TDD 800.877.8339, or ocr.boston@ed.gov.

In accordance with federal and state law, the University maintains information on security policies and procedures and prepares an annual campus security and fire safety report containing three years' worth of campus crime statistics and security policy statements, fire safety information, and a description of where students, faculty, and staff should go to report crimes. The fire safety section of the annual report contains information on current fire safety practices and any fires that occurred within on-campus student housing facilities. Upon request to the Office of the Vice President for Human Resources and Administration, PO Box 208322, 2 Whitney Avenue, Suite 810, New Haven CT 06520-8322, 203.432.8049, the University will provide this information to any applicant for admission, or prospective students and employees may visit <http://publicsafety.yale.edu>.

In accordance with federal law, the University prepares an annual report on participation rates, financial support, and other information regarding men's and women's intercollegiate athletic programs. Upon request to the Director of Athletics, PO Box 208216, New Haven CT 06520-8216, 203.432.1414, the University will provide its annual report to any student or prospective student. The Equity in Athletics Disclosure Act (EADA) report is also available online at <http://ope.ed.gov/athletics>.

For all other matters related to admission to Yale College, please write to the Office of Undergraduate Admissions, Yale University, PO Box 208234, New Haven CT 06520-8234; telephone, 203.432.9300; website, <http://admissions.yale.edu>.

Yale University's website is www.yale.edu; the Yale College Programs of Study is online at <http://catalog.yale.edu/ycps>.

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