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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 Online Course Information (http://students.yale.edu/oci) 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 L ₁ (first term of language study), L ₂ (second term), L ₃ (third term), L ₄ (fourth term), or L ₅ (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	A student must obtain the instructor’s permission before taking a course marked by a star. All seminars are starred.
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	LEPH	Laboratory of Epidemiology and Public Health
BASS	Bass Center for Molecular and Structural Biology	LFOF	Leitner Observatory and Planetarium
BASSLB	Bass Library	LGH	Abby and Mitch Leigh Hall
BCMM	Boyer Center for Molecular Medicine	LOM	Leet Oliver Memorial Hall
BCT	Becton Engineering and Applied Science Center	LORIA	Jeffrey H. Loria Center
BK	Berkeley College	LUCE	Henry R. Luce Hall
BM	Charles W. Bingham Hall	LWR	Lanman-Wright Memorial Hall
BML	Brady Memorial Laboratory	MC	Morse College
BR	Branford College	MEC	Malone Engineering Center
BRBL	Beinecke Rare Book and Manuscript Library	ML	Mason Laboratory
C	Connecticut Hall	OML	Osborn Memorial Laboratories
CC	Calhoun College	PC	Pierson College
CRB	Class of 1954 Chemistry Research Building	PH	Phelps Hall
CSC	Child Study Center	PM	Peabody Museum of Natural History
D	Durfee Hall	PWG	Payne Whitney Gymnasium
DAVIES	Davies Auditorium, Becton Center	RDH	Rudolph Hall
DC	Davenport College	RKZ	Rosenkranz Hall
DL	Dunham Laboratory	SB	Sage Hall
DOW	Dow Hall	SCL	Sterling Chemistry Laboratory
EAL	Electron Accelerator Laboratory	SDQ	Sterling Divinity Quadrangle
EM	Edwin McClellan Hall	SHM	Sterling Hall of Medicine
ES	Ezra Stiles College	SLB	Sterling Law Building
ESC	Class of 1954 Environmental Science Center	SM	Silliman College
EVANS	Edward P. Evans Hall	SMH	Sprague Memorial Hall
F	Farnam Hall	SML	Sterling Memorial Library
GML	Greeley Memorial Laboratory	SPL	Sloane Physics Laboratory
GRN	Holcombe T. Green, Jr., Hall	SSS	Sheffield-Sterling-Strathcona Hall
HGS	Hall of Graduate Studies	STOECK	Stoeckel Hall
JE	Jonathan Edwards College	SY	Saybrook College
JWG	Josiah Willard Gibbs Research Laboratories	TAC	The Anlyan Center
K	Kirtland Hall	TC	Trumbull College
KBT	Kline Biology Tower	TD	Timothy Dwight College
KCL	Kline Chemistry Laboratory	UT	University Theatre
KGL	Kline Geology Laboratory	V	Vanderbilt Hall
KRN	Kroon Hall	W	Welch Hall
L	Lawrance Hall	WL	Wright Laboratory
LC	Linsly-Chittenden Hall	WL-W	Wright Laboratory West
		WLH	William L. Harkness Hall
		WTS	Watson Center
		YCBA	Yale Center for British Art
		YUAG	Yale University Art Gallery

YALE COLLEGE CALENDAR WITH PERTINENT DEADLINES

This calendar includes a partial summary of deadlines given in the Academic Regulations (p. 33) and in the Yale College online publication *Undergraduate Regulations* (<http://yalecollege.yale.edu/campus-life/undergraduate-regulations>). Unless otherwise specified, references are to sections in the Academic Regulations, and deadlines fall at 5 p.m.

FALL TERM 2015

- Aug. 26 W Residences open to upperclassmen, 9 a.m.
- Aug. 28 F Residences open to freshmen, 9 a.m.
Required registration meetings for freshmen.
- Sept. 1 T Required registration meetings for upperclassmen.
- Sept. 2 W Fall-term classes begin, 8:20 a.m.
- Sept. 4 F Friday classes do not meet; Monday classes meet instead.
- Sept. 7 M Labor Day; classes do not meet.
- Sept. 11 F Final deadline to apply for a fall-term Leave of Absence. See Leave of Absence, Withdrawal, and Reinstatement (p. 59).
Withdrawal from Yale College on or before this date entitles a student to a full rebate of fall-term tuition. See *Undergraduate Regulations*.
- Sept. 16 W Final course schedules due for the Classes of 2018 and 2019.*
- Sept. 17 TH Final course schedules due for the Classes of 2016 and 2017.*
All students planning to complete degree requirements at the end of the fall term must file a petition by this date. See Special Arrangements (p. 68).
- Sept. 25 F Last day to withdraw from a course offered in the first half of the term without the course appearing on the transcript. See Withdrawal from Courses (p. 50) and Grades (p. 40).
- Sept. 26 S Withdrawal from Yale College on or before this date entitles a student to a rebate of one-half of fall-term tuition. See *Undergraduate Regulations*.
- Oct. 9 F Last day to convert from the Credit/D/Fail option to a letter grade in a course offered in the first half of the term. See Grades (p. 40).
- Oct. 14 W Deadline to complete applications for financial aid for the 2016 spring term, for students not enrolled in the 2015 fall term. See *Undergraduate Regulations*.
- Oct. 15 TH Deadline to apply for a spring-term 2016 Term Abroad. See Special Arrangements (p. 65).
- Oct. 16 F Last day to withdraw from a course offered in the first half of the term. See Withdrawal from Courses (p. 50) and Grades (p. 40).
- Oct. 19 M Classes begin for courses offered in the second half of the term.
- Oct. 20 T October recess begins, 11 p.m.
- Oct. 26 M Classes resume, 8:20 a.m.

- Oct. 30 F Midterm.
Last day to withdraw from a full-term course without the course appearing on the transcript. See *Withdrawal from Courses* (p. 50) and *Grades* (p. 40).
Deadline to apply for double credit in a single-credit course. See *Special Arrangements* (p. 69).
Withdrawal from Yale College on or before this date entitles a student to a rebate of one-quarter of the term's tuition. See *Undergraduate Regulations*.
- Nov. 13 F Last day to convert from the Credit/D/Fail option to a letter grade in a full-term course. See *Grades* (p. 40).
Last day to withdraw from a course offered in the second half of the term without the course appearing on the transcript. See *Withdrawal from Courses* (p. 50) and *Grades* (p. 40).
- Nov. 20 F November recess begins, 5:30 p.m.
- Nov. 30 M Classes resume, 8:20 a.m.
Last day to relinquish on-campus housing for the spring term without charge. See *Undergraduate Regulations*.
- Dec. 4 F Last day to convert from the Credit/D/Fail option to a letter grade in a course offered in the second half of the term. See *Grades* (p. 40).
- Dec. 11 F Classes end, 5:30 p.m.; reading period begins.
Last day to withdraw from a full-term course or a course offered in the second half of the term. See *Withdrawal from Courses* (p. 50) and *Grades* (p. 40).
- Dec. 16 W Reading period ends.
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. 17 TH Final examinations begin, 9 a.m.†
- Dec. 22 T 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. 23 W Residences close, 12 noon.

SPRING TERM 2016

- Jan. 13 W Residences open, 9 a.m.
- Jan. 18 M Martin Luther King Jr. Day; classes do not meet.
Required freshman registration meetings, 9 p.m.
- Jan. 19 T Spring-term classes begin, 8:20 a.m.
Upperclassmen pick up registration materials by 5 p.m. in their residential college dean's office.
- Jan. 22 F Friday classes do not meet; Monday classes meet instead.
- Jan. 27 W Final course schedules due for the Class of 2019.*

- Jan. 28 TH Final course schedules due for the Classes of 2017 and 2018.*
Final deadline to apply for a spring-term Leave of Absence. See Leave of Absence, Withdrawal, and Reinstatement (p. 59).
Withdrawal from Yale College on or before this date entitles a student to a full rebate of spring-term tuition. See *Undergraduate Regulations*.
- Jan. 29 F Final course schedules due for the Class of 2016.*
Last day for students in the Class of 2016 to petition for permission to complete the requirements of two majors.
- Feb. 5 F Last day to withdraw from a course offered in the first half of the term without the course appearing on the transcript. See Withdrawal from Courses (p. 50) and Grades (p. 40).
- Feb. 12 F Withdrawal from Yale College on or before this date entitles a student to a rebate of one-half of spring-term tuition. See *Undergraduate Regulations*.
Last day to convert from the Credit/D/Fail option to a letter grade in a course offered in the first half of the term. See Grades (p. 40).
- Feb. 26 F Last day to withdraw from a course offered in the first half of the term. See Withdrawal from Courses (p. 50) and Grades (p. 40).
- Mar. 2 W Classes begin for courses offered in the second half of the term.
- Mar. 5 S Deadline to apply for a fall-term 2016 Term Abroad or a 2016–2017 Year Abroad. See Special Arrangements (p. 65).
- Mar. 11 F Midterm.
Spring recess begins, 5:30 p.m.
Last day to withdraw from a full-term course without the course appearing on the transcript. See Withdrawal from Courses (p. 50) and Grades (p. 40).
Deadline to apply for double credit in a single-credit course. See Special Arrangements (p. 69).
Withdrawal from Yale College on or before this date entitles a student to a rebate of one-quarter of the term's tuition. See *Undergraduate Regulations*.
- Mar. 28 M Classes resume, 8:20 a.m.
- Apr. 8 F Last day to convert from the Credit/D/Fail option in a full-term course to a letter grade. See Grades (p. 40).
Last day to withdraw from a course offered in the second half of the term without the course appearing on the transcript. See Withdrawal from Courses (p. 50) and Grades (p. 40).
- Apr. 22 F Last day to convert from the Credit/D/Fail option to a letter grade in a course offered in the second half of the term. See Grades (p. 40).
- Apr. 29 F Classes end, 5:30 p.m.; reading period begins.
Last day to withdraw from a full-term course or a course offered in the second half of the term. See Withdrawal from Courses (p. 50) and Grades (p. 40).
- May 1 SU Applications for fall-term Leaves of Absence due. See Leave of Absence, Withdrawal, and Reinstatement (p. 59).
- May 5 TH Reading period ends.
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 6	F	Final examinations begin, 9 a.m. [†]
May 11	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 12	TH	Residences close for underclassmen, 12 noon.
May 13	F	Deadline to complete applications for financial aid for the fall and spring terms, 2016–2017. See <i>Undergraduate Regulations</i> .
May 23	M	University Commencement.
May 24	T	Residences close for seniors, 12 noon.

* Late schedules from all classes are fined and may not include the Credit/D/Fail option. See Grades and Registration and Enrollment in Courses (p. 47).

† Please note that examinations will be held on Saturdays and Sundays, December 19 and 20 and May 7 and 8.

YALE COLLEGE ADMINISTRATIVE OFFICERS

ADMINISTRATIVE OFFICERS

Peter Salovey, Ph.D., President of the University

Benjamin Polak, Ph.D., Provost of the University

Jonathan Holloway, Ph.D., Dean of Yale College

Tamar S. Gendler, Ph.D., Dean of the Faculty of Arts and Sciences

Joseph W. Gordon, Ph.D., Deputy Dean; Dean of Undergraduate Education

Jane Edwards, Ph.D., Senior Associate Dean; Dean of International and Professional Experience

Burgwell Howard, M.Ed., Senior Associate Dean; Dean of Student Engagement

Mark J. Schenker, Ph.D., Senior Associate Dean; Dean of Academic Affairs

Pamela Schirmeister, Ph.D., Senior Associate Dean for Special Projects

Susan E. Cahan, Ph.D., Associate Dean for the Arts

Jeanne Follansbee, Ph.D., Associate Dean; Dean of Yale Summer Session

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

Risë Nelson, M.A., Assistant Dean, Director of the Afro-American Cultural Center

Jeanine Dames, J.D., Assistant Dean for Career Strategies

Saveena Dhall, Ed.M., Assistant Dean; Director of the Asian American Cultural Center

Kelly N. Fayard, Ph.D., Assistant Dean; Director of the Native American Cultural Center

Eileen M. Galvez, M.Ed., Assistant Dean; Director of the Latino/a Cultural Center

Pamela Y. George, M.S., Assistant Dean of Academic Affairs

Alfred E. Guy, Jr., Ph.D., Assistant Dean; Director of the Yale College Writing Center

Carl Hashimoto, Ph.D., Assistant Dean; Director of the Science and Quantitative Reasoning Center

George G. Levesque, Ph.D., Assistant Dean of Academic Affairs; Director of the Seminar Office

Kelly McLaughlin, M.A., Assistant Dean for Assessment

Angela Gleason, Ph.D., Title IX Coordinator

Gabriel G. Olszewski, M.A., University Registrar

David P. Zupko, M.Ed., Deputy University Registrar

Laurie H. Ongley, Ph.D., Communications Manager for Student and Faculty Administrative Services

DEANS OF THE RESIDENTIAL COLLEGES

Berkeley College, Mia Reinoso Genoni, Ph.D.

Branford College, Sarah E. Insley, Ph.D.

Calhoun College, April M. Ruiz, Ph.D.

Davenport College, Ryan A. Brasseaux, Ph.D.

Timothy Dwight College, Sarah Mahurin, Ph.D.

Jonathan Edwards College, Joseph C. Spooner, Ph.D.

Morse College, Joel Silverman, Ph.D.

Pierson College, Amerigo Fabbri, Ph.D.

Saybrook College, Christine M. Muller, Ph.D.

Silliman College, Jessie Royce Hill, M.S.

Ezra Stiles College, Camille Lizarribar, J.D., Ph.D.

Trumbull College, Jasmina Besirevic-Regan, Ph.D.

ADMISSIONS AND FINANCIAL AID OFFICERS

Jeremiah Quinlan, M.B.A., Dean of Undergraduate Admissions

Margit A. Dahl, B.A., Director of Undergraduate Admissions

Caesar Storlazzi, M.M., University Director of Financial Aid

Diane Frey, B.A., Director of Student Financial Services Center

Kerry Worsencroft, B.S., Director of Student Financial Services Operations

FINAL EXAMINATION SCHEDULES

Rules governing the conduct of final examinations are given under Reading Period and Final Examination Period (p. 52).

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; (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 2015-2016 are:

2015	9 a.m.	2 p.m.	7 p.m.	2016	9 a.m.	2 p.m.	7 p.m.
17 Dec. Th	(36)	(34)	(31)	6 May F	(27)	(24)	
18 Dec. Fr	(22)	(33)		7 May Sa	(69)	(33)	(32)
19 Dec. Sa	(69)	(24)	(37)	8 May Su		(26)	(31)
20 Dec. Su		(26)	(27)	9 May M	(63)	(61)	(22)
21 Dec. M	(32)	(23)	(63)	10 May Tu	(37)	(23)	(36)
22 Dec. Tu	(64)	(61)		11 May W	(64)	(34)	

A student who in a given term elects two courses with the same examination group number will be charged \$35 for a make-up examination. (See "Postponement of Final Examinations" under Completion of Course Work.)

SUBJECT ABBREVIATIONS

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

RSEE	Russian and East European Studies
RUSS	Russian
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
STAT	Statistics
STCY	Study of the City
SWAH	Kiswahili
TAML	Tamil
TBTN	Classical Tibetan
THST	Theater Studies
TKSH	Turkish
UKRN	Ukrainian
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 2015–2016, 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 perusing the pages of this catalog 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. The Blue Book 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.

Jonathan Holloway
Dean of Yale College
Edmund S. Morgan Professor of History, African
American Studies, and American Studies

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 5,200 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 in 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 for the reason that these competences mature and deepen. The best high school writer is still not the writer he or she could be; students who do not use their mathematics 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.

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, and the best advising happens when students and advisers share a foundation of common intellectual interests.

For incoming students, who have not yet developed relationships with academic advisers, Yale College furnishes a unique constellation of advising linked to the residential colleges. Parts of this constellation include the residential college deans, freshman academic advisers, and freshman (peer) counselors. It is not any one adviser's job to mandate a particular set of courses, but rather to help students gather information in order to craft an effective program of study.

After freshman year, the selection of academic advisers is contingent on the student's intended major field. Sophomores who plan to major in the humanities or the social sciences select a sophomore adviser from among the Yale College faculty; those who plan to major in the sciences, engineering, or mathematics select as their adviser the designated representative in their potential major, often the director of undergraduate studies. The academic adviser for juniors and seniors in most majors is the director of undergraduate studies or a designated departmental representative. Moreover, seniors in most majors have the opportunity to select a senior essay or senior project adviser from among the faculty members in their major department or program.

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

Distributional Requirements

The distributional requirements, described below, are intended to assure 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, and represent the least that an educated person should seek to know. 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 the broad range of human thought, expression, and endeavor—cultivates an educated recognition of the greatest accomplishments of the past and enriches the capacity to participate fully in the life of our time. Exploration of other civilizations, ancient and modern, gives students insight into the experiences of others and informs critical examination of their own culture. Those who create or perform works of art experience firsthand the joy and discipline of artistic expression. By rigorously and systematically examining the value and purpose of all that surrounds them, students of the humanities and arts can acquire essential preparation for many different kinds of careers. But independently of any particular application, study of these subjects fosters understanding of, and delight in, the reach and sweep of the human spirit.

Area requirement in the sciences (two course credits) 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. These include an ability to evaluate the opinions of experts, to distinguish special pleading and demagoguery from responsible science, and to realize which things are known and which unknown—which are knowable and which unknowable—to science. The theoretical inquiry, experimental analysis, and firsthand problem solving inseparable from studying a science give rise to new modes of thought. To know science is to appreciate a thousand intricacies in nature and the universe, which are hidden from casual observation but which, once revealed, lend richness to everyday life.

Area requirement in the social sciences (two course credits) Insights gained through the study of the social sciences take on a critical significance at a time when the world's population is increasing rapidly and diverse cultures are coming into closer contact and even conflict. Among the major subjects of inquiry in the social sciences are international and area studies. Those who have been educated in the United States ought especially to acquire knowledge of the societies of Africa, Latin America, Asia, the Middle East, and eastern and western Europe, as well as broaden their familiarity with the range of cultures in North America. Questions of class, gender, public health, justice, and identity are also central to work in the social sciences. Methods in the social sciences test for connections between the familiar and the exotic, the traditional and the contemporary, the individual and the group, the predicted result and the anomalous outcome. Social science theories propose explanations for the entire range of human phenomena: from governments and economies to social organizations, communicative systems, cultural practices, and the psychology of individuals.

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 (p. 33) in the Academic Regulations (p. 33).

Skills requirement in quantitative reasoning (two course credits) The mental rigor resulting from quantitative study has been celebrated since ancient times, and applications of quantitative methods have proven critical to many different disciplines. Mathematics and statistics are basic tools for the natural and the social sciences, and they have become 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 Computer Science. Such courses may also be found in Astronomy; Chemistry; Economics; Engineering; Environmental Studies; Geology and Geophysics; Global Affairs; Linguistics; Molecular, Cellular, and Developmental Biology; Philosophy; Physics; Political Science; Psychology; and Sociology.

Skills requirement in writing (two course credits) The ability to write well is one of the hallmarks of a liberal education 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. Over 130 courses, spanning approximately 40 different academic programs, give special attention to writing. Such courses, designated WR in the course listings, 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 plan a schedule of courses in their major in consultation with a representative of the department or program concerned, and must secure the consultant's written approval. 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.

Students seeking the B.S. or the B.A. degree with a major in science 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 should have their schedules approved by 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 a science typically declare their major at the beginning of the junior year. In the sophomore year these students' schedules are signed by a sophomore 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 seventy possible majors (p. 90). 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 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 of two or more term courses taken in the freshman and sophomore years.

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 (p. 636) outlined under Subjects of Instruction. A Special Divisional Major may not be offered as one of two majors.

The Residential Colleges

The most conspicuous advantage of a university is that it presents students with a great breadth of learning and gives them access to scholars who are engaged not only in communicating knowledge but also in discovering it. But the potential disadvantages of a large university are that its size and complexity may discourage communication, and that teachers and students may become less of a challenge to each other. In such an event, the discovery of new knowledge suffers as much as do teaching and learning.

In order to mitigate such disadvantages as it grew from a small college into a modern research university, Yale established residential colleges. Initially made possible through gifts from Edward Stephen Harkness, B.A. 1897, the colleges are more than living quarters; they are small communities of men and women whose members know one another well and learn from one another. Each college has its own dining hall, library, common rooms, extracurricular activity spaces, and intramural athletic teams, and each college celebrates the progress of the academic year with various festivities, concerts, and dramatic presentations.

There are twelve colleges: Berkeley, Branford, Calhoun, Davenport, Timothy Dwight, Jonathan Edwards, Morse, Pierson, Saybrook, Silliman, Ezra Stiles, and Trumbull. At the head of each college is a resident master; and in each college a dean advises students on both academic and nonacademic matters. Associated with the master and the dean as fellows are about fifty additional members of the University drawn from different departments and schools. A few fellows reside in the college; others have offices there.

In the summer before arrival, each freshman is assigned to one of the twelve residential colleges. Most freshmen reside in a quadrangle known as the Old Campus. Whether freshmen live there or elsewhere on campus, they participate fully in the life of their residential college. All freshmen and sophomores are required to live on campus, and most juniors and seniors choose to do so. Whether they live on campus or off, students normally remain members of the same college throughout their undergraduate careers.

International Experience

While students can be introduced to the dynamics of a globalizing world through the course offerings at Yale, 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 postgraduation, as well as a large and growing number of fellowships to support students abroad.

Students can visit the Center for International and Professional Experience (<http://cipe.yalecollege.yale.edu>) 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 (<http://summer.yale.edu>) and by eligible outside programs through Summer Abroad (<http://www.yale.edu/studyabroad>). Students on financial aid may be eligible for summer funding through the International Summer Award program (<http://www.yale.edu/yalecollege/international/funding/isa>).

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 and, most significantly, to speak, write, and learn in a foreign language. 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 (p. 65) in the Academic Regulations. Additional information is available from the Study Abroad office in the Center for International and Professional Experience (<http://www.yale.edu/studyabroad>).

YALE-IN-LONDON

The Yale-in-London program offers spring-term courses in British culture and society 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's Web site (<http://britishart.yale.edu/education/yale-college-students/yale-in-london>), or from the Yale-in-London office at the Yale Center for British Art, or by e-mail 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, each lasting six weeks. There are two courses in each session, with topics in history, history of art, architecture, literature, and drama. The courses are open to undergraduates and carry full Yale course credit, although enrollment

in Yale-in-London summer session does not count as a term of enrollment in Yale College. Overnight field trips may be included. Accommodations are provided. Course descriptions and further information are available on the program's Web site (<http://britishart.yale.edu/education/yale-college-students/yale-in-london>), or from the Yale-in-London office at the Yale Center for British Art, or by e-mail 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 encouraging and coordinating teaching and research on international affairs and on 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 provides 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.

The MacMillan Center invites visiting scholars to Yale each year from a range of disciplines and countries; awards financial support to Yale students studying languages or traveling abroad; and sponsors lectures, conferences, workshops, symposia, films, and art events. The Center also produces *The MacMillan Report*, an Internet show that features Yale faculty in international and area studies. Further information about the MacMillan Center is available on the Center's Web site (<http://www.yale.edu/macmillan>).

JACKSON INSTITUTE FOR GLOBAL AFFAIRS

The Jackson Institute's mission is to inspire and prepare Yale students for global citizenship and leadership. The Institute administers the undergraduate major in Global Affairs, with tracks in international development and international security. In addition, the Institute offers a number of courses that are open to students in Yale College, including GLBL 101, Gateway to Global 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's Web site (<http://jackson.yale.edu>).

Yale Summer Session

Yale Summer Session offers courses in the humanities, social sciences, and sciences. Several summer courses, including language courses, are taught abroad, and some courses are taught on line. Courses in the Summer Session are in most cases similar to courses offered during the regular academic year, but in a more concentrated and intensive form. Yale College students may, if they wish, 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 Web site (<http://summer.yale.edu>).

Special Programs

DIRECTED STUDIES

Directed Studies is a selective freshman interdisciplinary program in Western civilization. One hundred twenty-five freshmen are admitted to the program each fall.

The Literature, Philosophy, and History and Politics tracks of Directed Studies together comprise one coherent program of study, and students must enroll in all three tracks simultaneously. Successful completion of the fall-term Directed Studies courses is a prerequisite to enrolling in the spring-term courses.

The Freshman Web site (<http://yalecollege.yale.edu/content/directed-studies-ds>) describes the program and explains the application procedure. Additional information is available on the program's Web site (<http://www.yale.edu/directedstudies>).

FRESHMAN SEMINAR PROGRAM

The Freshman Seminar program offers first-year students the opportunity to enroll in small classes with some of Yale's most eminent faculty members. Roughly fifty freshman seminars across a wide range of subjects are offered every year, in both fall and spring terms. Some seminars provide an introduction to a particular field of study; others take an interdisciplinary approach to a variety of topics. Whatever the subject and method of instruction, all seminars are designed with freshmen in mind and provide a context for developing relationships with faculty members and peers.

A description of the program and application procedures can be viewed on the program's Web site (<http://yalecollege.yale.edu/content/freshman-seminar-program-2>).

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's Web site (<http://yalecollege.yale.edu/academics/special-academic-programs/residential-college-seminar-program>).

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. The next set of DeVane Lectures will be offered in spring 2016. Nicholas Christakis, Sol Goldman Family Professor of Social and Natural Science, Department of Sociology, will offer “Health of the Public: Medicine and Disease in Social Context.” Details of the course are listed under DeVane Lecture Course (p. 224) in Subjects of Instruction. Supplementary meetings will be held for those students taking the lectures for credit.

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 Web site (<http://afrotc.yalecollege.yale.edu>) or under Aerospace Studies (p. 92) in Subjects of Instruction. Further information about the Naval ROTC program (including the Marine Corps program) can be found on the Yale NROTC Web site (<http://nrotc.yalecollege.yale.edu>) or under Naval Science (p. 532) in Subjects of Instruction. Students not matriculated at Yale who are participating in a Yale ROTC program as part of a cross-town arrangement are subject to Yale College’s *Undergraduate Regulations* (<http://yalecollege.yale.edu/campus-life/undergraduate-regulations>).

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 2015–2016 is Anne Fadiman.

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 2015–2016 is Louise Glück.

YALE JOURNALISM INITIATIVE

The Yale Journalism Initiative brings a distinguished writer to campus to teach an advanced journalism seminar, ENGL 467. Students who complete the seminar may apply to become Yale Journalism Scholars, a distinction that provides access to summer support for internships, career counseling with a journalism specialist in the Writing Center, 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 Web site (<http://writing.yalecollege.yale.edu/yale-journalism-initiative>).

EDUCATION STUDIES UNDERGRADUATE SCHOLARS PROGRAM

The Education Studies Undergraduate Scholars program establishes 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 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, Foundations in Education Studies. For more information, see the program's Web site (<http://yalecollege.yale.edu/content/education-studies>).

ENERGY STUDIES UNDERGRADUATE SCHOLARS PROGRAM

Yale Climate & Energy Institute (YCEI) sponsors the Energy Studies Undergraduate Scholars program. The program promotes a multidisciplinary approach to the linked challenges of energy and climate, and provides students with training in the science and technology of energy, the environmental and social impacts of energy production and use, and the economics, planning, and regulation of energy systems and markets. Energy Studies Scholars acquire the broad knowledge and skills needed for advanced studies and for leadership in energy-related fields. Further information is available on the program's Web site (<http://climate.yale.edu/prog-init/energy-studies>).

SPECIAL ACADEMIC PROGRAM IN HUMAN RIGHTS

The Special Academic Program in Human Rights 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. For more information see the Human Rights program Web site (<http://humanrights.yale.edu>).

GLOBAL HEALTH STUDIES PROGRAM

The Global Health Studies program is designed for students interested in understanding and addressing pressing global health challenges. Although 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 Fellow (GHF). Fellows are typically selected in the fall of their sophomore year although, in exceptional cases, juniors may also be accepted. GHFs complete an interdisciplinary course of study that includes required and elective courses and fieldwork (e.g., internships with NGOs, or field-based research either with faculty or independently with faculty guidance).

In the summer after junior year, GHFs conduct their own independent global health fieldwork, for which they receive support in the form of course work, designated funding, and mentorship from an assigned global health faculty adviser. During their senior year, GHFs are expected to incorporate their fieldwork and classroom experiences into their senior requirement and to develop a publication-worthy written product. Additional information can be found on the program's Web site (<http://ghi.yale.edu>).

CENTER FOR TEACHING AND LEARNING

The Yale Center for Teaching and Learning (CTL) provides an array of teaching, tutoring, writing, and technology-enabled learning programs distributed across the University. The Center supports effective course design and promotes evidence-based teaching methods for University instructors, including faculty and teaching assistants. The Center also supports student learning and provides opportunities for students to develop as teachers, mentors, and leaders. Both the Center for Language Study and the Yale College Writing Center are included as units within the CTL. More information is available on the Web site (<http://ctl.yale.edu>) of the Center for Teaching and Learning.

CENTER FOR LANGUAGE STUDY

The Center for Language Study (CLS), a unit of the Center for Teaching and Learning, 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 (<http://cls.yale.edu/dils>) (DILS) for the study of languages not taught at Yale, and the Fields program (<http://cls.yale.edu/fields>) for discipline-specific and advanced language study. 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 and multimedia labs. For more information, including hours, a list of resources, and information about Yale's foreign language requirement and placement testing, see the Center's Web site (<http://cls.yale.edu>).

EXPOSITORY WRITING

The Yale College Writing Center, a unit of the Center for Teaching and Learning, supports a range of courses and tutoring services to help undergraduates improve their writing. The English department offers several courses specifically designed to prepare students for writing throughout the University, and other departments in the humanities, social sciences, and sciences complement this offering with courses (designated WR in the course listings) that give special attention to the conventions and expectations of writing in particular disciplines.

Beyond the regular departmental offerings, the Writing 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 Writing Center Web site (<http://writing.yalecollege.yale.edu/using-sources>) offers information on using sources effectively and avoiding plagiarism.

The Yale College Writing Center is maintained through the continuing support of the Bass family, the Newhouse Foundation, and other foundations. Its mission is to encourage excellence in writing and the use of writing for learning throughout the College. More detailed information is available on the Writing Center Web site (<http://writing.yalecollege.yale.edu>).

SCIENCE AND QUANTITATIVE REASONING TUTORS

Tutoring programs for science and quantitative reasoning courses are offered through the Center for Teaching and Learning. The Residential College Math and Science Tutoring program offers tutoring in the residential colleges to all Yale College students. Tutoring is available at scheduled times and on a walk-in basis, and is provided in all areas of math and science as well as in economics. Information about tutoring can be found at each residential college dean's office and on the Residential College Math and Science Tutoring Web site (<http://science.yalecollege.yale.edu/residential-college-math-science>).

To assist students who require more personalized or longer-term support, the Center for Teaching and Learning also administers a Science and QR Tutoring program. This program provides individual tutoring to undergraduates in the full range of science and quantitative disciplines, including economics. Any student enrolled in Yale College who is experiencing academic difficulty in a course, as confirmed by the instructor, is eligible for up to ten hours of tutoring per course each term free of charge. Further information is available at each residential college dean's office and on the CTL Web site (<http://science.yalecollege.yale.edu/science-quantitative-reasoning-1>).

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 facilitates individual accommodations for students with disabilities, and works to remove physical and attitudinal barriers to their full participation in the University community. The office provides technical assistance, information, and disability awareness training to any member of the Yale community.

Current and prospective students with disabilities are encouraged to contact the Resource Office on Disabilities to schedule a meeting with staff at 35 Broadway (rear entrance), room 222. Inquiries can be made by mail to Resource Office on Disabilities, Yale University, P.O. Box 208305, New Haven, CT 06520-8305, or by phone at (203) 432-2324. Additional information is available on the Resource Office Web site (<http://www.yale.edu/rod>).

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

Yale College students with appropriate qualifications may enroll in courses in the Graduate School of Arts and Sciences. Such enrollment requires permission of the

course's instructor and of the director of graduate studies of the department in which the course is offered.

A limited number of students of demonstrated ability 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. Details of the requirements are listed under Special Arrangements (p. 65) in the Academic Regulations (p. 33).

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.

ELI WHITNEY STUDENTS PROGRAM

The Eli Whitney Students program is designed for individuals with high academic potential who seek to obtain a bachelor of arts or bachelor of science degree from Yale College and who may need to study on a part-time basis. The program enrolls a small number of students who have demonstrated leadership and maturity and who enrich Yale College through their life experience, sense of purpose, and character.

A minimum of eighteen course credits from Yale as a matriculated student is required, and the degree must be completed within seven years. The program is described more fully under Eli Whitney Students Program (p. 77) in the Academic Regulations (p. 33). Additional information is available on the program's Web site (<http://admissions.yale.edu/eli-whitney>).

YALE 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 for 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 program's Web site (<http://www.yale.edu/yvisp>).

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, carry no course credit, and 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 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 Web site (<http://www.yale.edu/pbk/home>).

PRIZES

For a list of the numerous prizes open annually to students in Yale College, consult the Yale Prizes Web site (<http://secretary.yale.edu/services-resources/lectureships-fellowships-and-prizes>).

Miscellaneous

Expenses and expected patterns of payment are described in the *Undergraduate Regulations* (<http://yalecollege.yale.edu/campus-life/undergraduate-regulations>), published on line by the Yale College Dean's Office. The *Undergraduate Regulations* also provides details of student coverage in the Yale Health medical plan. Information about financing a Yale education can be found on the Web site of Student Financial Services (<http://www.yale.edu/sfas/finaid>).

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, neither full-time nor 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 (p. 77).

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 (p. 18) section.

1. **Distributional requirements for the freshman, sophomore, and junior years**

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

Distributional requirements for the freshman 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 freshman 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 freshman 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 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, or Spanish and who present scores of 5, or who have taken the Advanced Placement examination in Latin and who present scores of 4 or 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, or Spanish, or a score of 4 or 5 on the Advanced Placement test in

Latin, 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 Web site of the Center for Language Study (<http://cls.yale.edu>). 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 O, Credit from Other Universities (p. 81). 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 Yale Curriculum section under the heading International Experience (p. 24).

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, 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 (including American Sign Language) 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 freshman, 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 Nondegree 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 freshman 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 freshman year. See section O, Credit from Other Universities (p. 81). 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 freshman, 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 freshman year** If, with the permission of the residential college dean, a freshman 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 shall 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 shall 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.

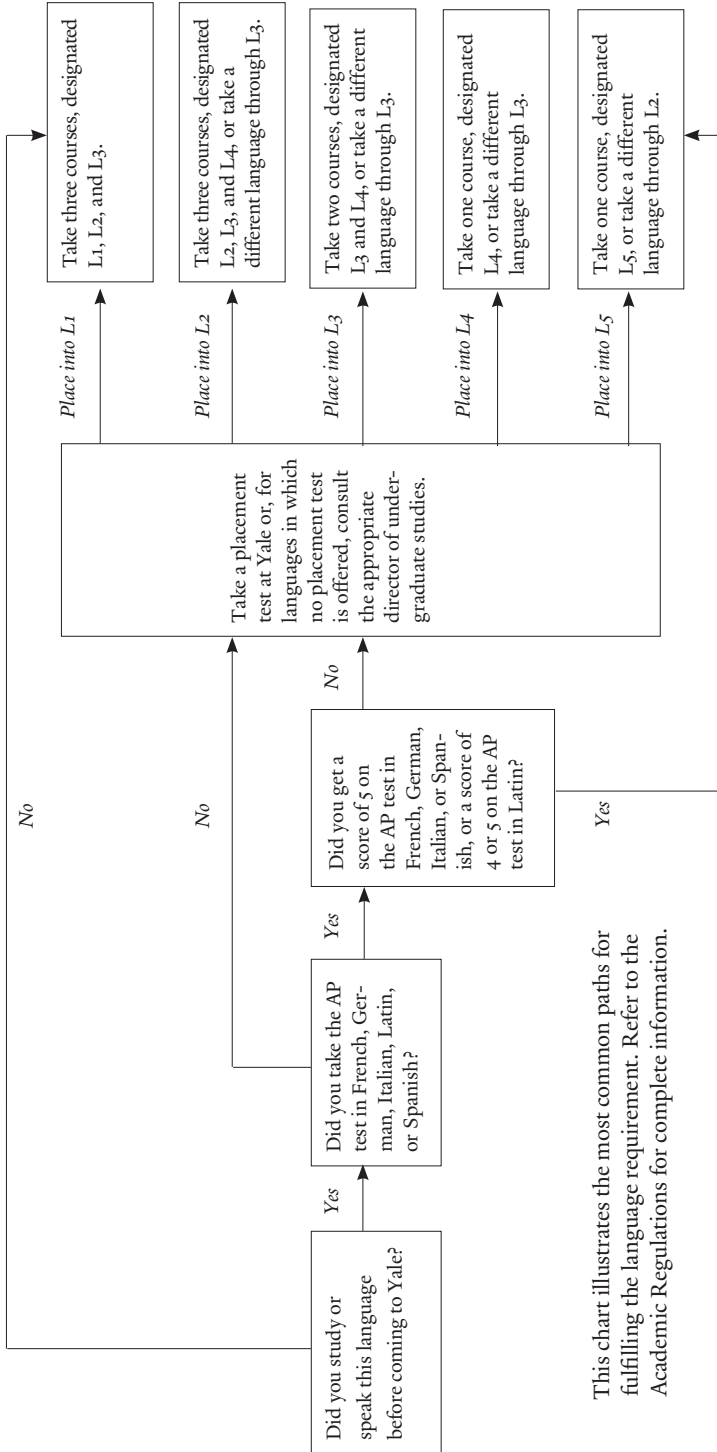
EIGHT TERMS OF ENROLLMENT

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 P, Acceleration Policies (p. 84). (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. 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* (<http://yalecollege.yale.edu/campus-life/undergraduate-regulations>).

Graduation in fewer than eight terms of enrollment is possible: see section P, Acceleration Policies (p. 84). 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 (p. 75).

COMMON PATHS TOWARD FULFILLMENT OF THE LANGUAGE REQUIREMENT



This chart illustrates the most common paths for fulfilling the language requirement. Refer to the Academic Regulations for complete information.

B. Grades

LETTER GRADES

The letter grades in Yale College are as follows:

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

CREDIT/D/FAIL OPTION

In order to encourage academic exploration and to promote diversity in students' programs, the Yale College Faculty has provided that students may elect a certain number of courses on a Credit/D/Fail basis.

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 offered in Yale College during the fall and spring terms are available for election under the Credit/D/Fail option. Courses in Yale Summer Session may not be taken under the Credit/D/Fail option.
3. **Total number of courses** 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 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.
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 nor 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** Students must indicate on their course schedules at the beginning of a term the use they wish to make during that term of the Credit/D/Fail option. 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 a student must elect at least two courses, representing at least two course credits, for letter grades. If a student indicates on the course schedule more than two course credits being taken on the Credit/D/Fail option, the registrar will record only the first two of them, in the order in which they are listed, as being taken on that basis, and the student will not be permitted to take the others on the Credit/D/Fail option.
9. **Late course schedules** Because a decision to employ the Credit/D/Fail option in a course must be declared at the beginning of the term on the student's course schedule, and because conversion from a letter grade to the Credit/D/Fail option is not possible for students who submit their schedules on time, a student who submits the schedule after the date on which it is due may not employ the Credit/D/Fail option in any course during that term. See "Enrollment in Courses" in section E (p. 47). The only exception to this rule may be in the case of a student who for some valid and extraordinary reason cannot submit the course schedule on time and who has the permission of the residential college dean and the registrar to submit it late. If the college dean approves, such a student may employ the Credit/D/Fail option only by submitting to the college dean by the date on which the course schedule is due—as published in the Yale College Calendar with Pertinent Deadlines (p. 8)—a written statement specifying the course (or courses) that the student wishes to take on the Credit/D/Fail basis.
10. **Registration withheld** In order to employ the Credit/D/Fail option, students whose registration is being withheld by the Office of Student Financial Services or any other administrative office of the University must submit their schedules on time, before the deadline indicated on the student's course schedule and listed in the Yale College Calendar with Pertinent Deadlines (p. 8).
11. **Conversion to a letter grade** Until the deadline published in the Yale College Calendar with Pertinent Deadlines (p. 8), a student who has elected a course on the Credit/D/Fail basis may choose to receive a letter grade in that course by converting enrollment to a letter grade online by means of the Yale Student Information System (SIS) or by filing the appropriate form in the office of the residential college dean. After the deadline such conversion is not possible. If a student converts from the Credit/D/Fail option to a letter grade before the deadline, the option may not again be resumed even if the student desires to do so before the deadline.
12. **Conversion from a letter grade to Credit/D/Fail** A course once elected for a letter grade may not subsequently be converted to a course taken on the Credit/D/Fail basis.
13. **Courses selected after the deadline** A student who for any reason has been granted extraordinary permission by the Committee on Honors and Academic Standing to elect a new course after the deadline for submitting a course schedule may not employ the Credit/D/Fail option in that course. A change of level in courses in which the subject is taught in an ordered progression is not considered the election of a new course.
14. **Acceleration credit** Work completed under the Credit/D/Fail option cannot yield acceleration credit.

15. **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 under Honors (p. 31) in the Yale Curriculum section.
16. **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 (p. 31) in the Yale Curriculum section.

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 is offering the course 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 (p. 8), 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 (p. 8), 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 (p. 50).

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 (Withdrew) 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 (Withdrew) 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 (Withdrew) for the course. See the Yale College Calendar with Pertinent Deadlines (p. 8) 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 (p. 8), is not possible. See section F, Withdrawal from Courses (p. 50).

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 (p. 54).

6. **Withdrawal from Yale College** Whether a student withdraws from Yale College for personal, medical, academic, or disciplinary reasons, the entry placed in each case on the student’s transcript is the word “Withdrew” together with the date of the withdrawal.
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 (p. 90).
8. **Distribution of grade reports** At registration each year, a student is given the opportunity to declare whether his or her grades may be released to certain other parties. If the student gives permission for grades to be released to a guardian or to parents, after each term of that year the University Registrar’s Office will send a grade report to them. If a student gives permission for grades to be released to a secondary school or Alumni Schools Committee, grade reports will be furnished to them only upon specific request of the school or the committee. Upon written request of the student, the University Registrar’s Office will also send a copy of the grade report to any additional person or agency designated by the student.
9. **Early access to grade report** Early 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).
10. **Transcript orders** Transcripts may be ordered either at Student Financial Services, 246 Church Street, or through the Web site of the University Registrar’s Office (<http://www.yale.edu/sfas/registrar>). The charge is \$7 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** A few 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 a few 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 yearlong 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 yearlong course sequence may receive course credit routinely for that term’s work, except where noted otherwise in the course listing.

Note that completion of a modern foreign language course numbered 110 does not award credit unless and until the subsequent term, numbered 120, is also successfully completed. Except in intensive, double-credit courses in which the equivalent of one year of language study is covered in one term, credit may not be given in any circumstance for the first term only of an introductory modern foreign language; neither instructors nor departments have the authority to make an exception to this rule. With some exceptions, credit will be given for successful completion of the second term only of an introductory modern foreign language, or for the first term only or the second term only of an intermediate modern foreign language.

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 (Withdraw) 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. 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.

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 freshman 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 (p. 58).

E. Registration and Enrollment in Courses

REGISTRATION

Every student is required to register, and to create a preliminary online course schedule as described below under “Enrollment in Courses,” at the beginning of each term in which he or she is to be enrolled in courses at Yale College.

1. **Fall-term registration** To register for the fall term, all freshmen must attend a registration meeting with their residential college dean and freshman counselor on the Friday before classes begin, as published in the Yale College Calendar with Pertinent Deadlines (p. 8). Upperclassmen 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 (p. 8). 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, freshmen 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 (p. 8). 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 (p. 8). Students whose registration is being temporarily withheld by an administrative office of the University are nonetheless required to report for spring-term registration as given immediately above.
3. **Late registration** A student who, for reasons other than incapacitating illness, 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 to a fine of \$50.

ENROLLMENT IN COURSES

Enrollment in courses can be accomplished only by the submission of an approved course schedule or, in amendment of the course schedule, by the submission of 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 shall appear on the student’s transcript unless a student formally withdraws from a course before the relevant deadline, as listed in the Yale College Calendar with Pertinent Deadlines (p. 8). See section F, Withdrawal from Courses (p. 50).

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, students in all classes 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 (p. 8). 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 (p. 8), 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. **Credit/D/Fail option** A student who submits a course schedule after the date on which it is due may not employ the Credit/D/Fail option in any course during that term. See “Credit/D/Fail Option” in section B (p. 40), paragraph 9.
 6. **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.
 7. **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.
 8. **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. If a student enters a course on the course schedule without the appropriate permission, the instructor may direct the registrar to drop the student from the class.
 9. **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.
 10. **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.
 11. **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.
 12. **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.
13. **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 some 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.
 14. **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.
 15. **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.
 16. **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 Web site (<http://yalecollege.yale.edu/content/academic-field-trip-policies>).

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 under “Academic Warning” and “Dismissal for Academic Reasons” in section I (p. 58).

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 (p. 8), 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 (p. 8), 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 (Withdraw) 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 (Withdraw) for the course. See the Yale College Calendar with Pertinent Deadlines (p. 8) 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 “General Regulations Concerning Grades and Transcripts” in section B (p. 40). See also “Work Incomplete at the End of Term” and “Postponement of Final Examinations” in section H (p. 54).
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 (p. 8). Instructors do not have the authority to give permission for these deadlines to be extended; only the residential college dean has this authority. See "Work Incomplete at the End of Term" in section H (p. 54). 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. A schedule of final examinations may be found on the page Final Examination Schedules (p. 14).
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 (p. 14). 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. Fall-term grades are due by 5 p.m. on January 4, 2016; spring-term grades are due within one week of the end of the final examination period; grades for seniors in the spring term are due within forty-eight hours of the end of the final examination period.

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. It is generally expected that the student will submit course work in person, either to the instructor or to a person explicitly designated by the instructor, such as a teaching fellow or an administrative assistant. Students who submit course work in a manner other than in person, directly to an appropriate individual (e.g., place it under a door or in a box in a hallway), do so at their own risk. 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 e-mail account unless they have explicitly authorized such electronic submission in the syllabus for the course 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 below in “Work Missed During the Term” and in “Postponement of Final Examinations,” 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 is the instructor’s. 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, 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.”

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, 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, not to a final examination missed for any reason; see “Postponement of Final Examinations.”

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 "General Regulations Concerning Grades and Transcripts" in section B (p. 40), and section F, Withdrawal from Courses (p. 50).

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 saving data on removable disks 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, 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 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 (p. 14) and paragraph 4 in section G, Reading Period and Final Examination Period (p. 52).

- * 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 (p. 14). Occasionally an instructor may arrange an option for an alternative final examination in addition to the regularly scheduled examination. See paragraph 5 in section G, Reading Period and Final Examination Period (p. 52). 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 underclassmen 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 also carry authorization for a student to submit other work late in that course. See “Work Incomplete at the End of Term.”

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.”

EXCLUSION FROM COURSES

Any student may, because of excessive absences or unsatisfactory work, be excluded from a course without credit at any time upon recommendation, made by 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 “Requirements for Academic Good Standing” in section D, Promotion and Good Standing (p. 46). 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.

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 “Makeup of Course Deficiencies for Promotion or Academic Good Standing” below and section D, Promotion and Good Standing. (p. 46) 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.”
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 “Reinstatement” in section J (p. 59).

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 O, Credit from Other Universities (p. 81). 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 “Requirements for Academic Good Standing” in section D (p. 46). 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 tenth 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 tenth 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" in the section "Financial Services" in the Yale College online publication *Undergraduate Regulations* (<http://yalecollege.yale.edu/campus-life/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" in the section "Financial Services" in the *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 P, Acceleration Policies (p. 84).
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 the Student Financial Services Center before leaving Yale; see "Rebates of Undergraduate Charges" in the section "Financial Services" in the *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” in the section “Health Services” in the *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.

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, (203) 432-2914.

Yale College reserves the right to require a student to withdraw 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 the student is a danger to self or others because of a serious medical problem, or that the student has refused to cooperate with efforts deemed necessary by Yale Health to determine if the student is such a danger. An appeal of such a withdrawal must be made in writing to the dean of Yale College no later than seven days from the date of withdrawal.

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.

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, and a notation to this effect will be entered on the transcript.

REBATES OF UNDERGRADUATE CHARGES

For information on financial rebates on account of withdrawal from Yale College, consult the section “Financial Services” in the *Undergraduate Regulations* (<http://yalecollege.yale.edu/campus-life/undergraduate-regulations>).

REINSTATEMENT

During the time that a student who has withdrawn is away from Yale College, the Committee on Reinstatement expects him or her to have been constructively occupied and to have maintained a satisfactory standard of conduct.

Students whose withdrawal was for either academic reasons or 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. (Note that students who withdrew for personal reasons rather than face disciplinary charges that are pending against them are not eligible for reinstatement; see above under “Withdrawal for Personal Reasons.”) Students whose withdrawal had been authorized as medical by the director of Yale Health must normally remain away at least one full term before a return to Yale College, not including the term in which the withdrawal occurred. The period of withdrawal for disciplinary reasons is set by the Yale College Executive Committee at the time the student’s enrollment is suspended.

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 (p. 58). Courses conducted on line, 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 two years or more, 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 or the applicant’s residential college dean. In some cases, the Committee on Reinstatement may require more than two courses or courses in a specific subject area. 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.

Inquiries about reinstatement should be directed to the chair of the Committee on Reinstatement, Yale College Dean’s Office, 110 SSS, Yale University, P.O. Box 208241, New Haven, CT 06520-8241 or (203) 432-2914. For reinstatement to a fall term, applications must be submitted in person or by receipted mail by July 1. For reinstatement to a spring term, applications must be submitted in person or by receipted mail by November 1. These deadlines are strictly enforced.

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 2015–2016, currently assessed at \$3,050. 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. Federal financial aid policies may assess such students a “ninth-term penalty” of an additional Student Income Contribution, currently \$3,050. If such a penalty is assessed, Student Financial Services will forgive

the additional \$3,050 expectation, replacing the SIC with a grant funded by the University.

REINSTATEMENT INTERVIEWS

Interviews with members of the Committee on Reinstatement are required of all applicants for reinstatement. The committee cannot approve a student's return to Yale College until after the necessary interviews have taken place. These may include individual and face-to-face 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 preference is to meet in person, students who are unable to travel to New Haven because of financial constraints may be granted permission to interview via Skype or telephone, with approval of the director of Yale Health or the chief of the Mental Health and Counseling department.

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.

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 an applicant to defer his or her return until a time later than the one originally proposed.

Students who are reinstated to Yale College are expected to complete and pass all of their courses at the conclusion of each of the two terms following their reinstatement. A student who fails to meet this condition is ordinarily required to withdraw after his or her 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.

Inquiries about reinstatement should be directed to the chair of the Committee on Reinstatement, Yale College Dean's Office, 110 SSS, Yale University, P.O. Box 208241, New Haven, CT 06520-8241. For reinstatement to a fall term, applications must be submitted in person or by receipted mail by July 1. For reinstatement to a spring term, applications must be submitted in person or by receipted mail by November 1. These deadlines are strictly enforced. For additional information about reinstatement to Yale College, consult the Web page Reinstatement to Yale College (<http://yalecollege.yale.edu/faculty-staff/faculty/policies-reports/reinstatement-yale-college>).

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 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. The student must have served in the U.S. Armed Forces for a period of more than thirty consecutive days.
2. The student must give advance written or verbal notice of such service to his or her residential college dean. In providing the advance notice the student does not need to indicate whether he or she intends 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. The student 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, the student should contact his or her residential college dean to determine if the student remains eligible for guaranteed reinstatement.
4. The student must notify Yale within three years of the end of the U.S. military service of his or her intention to return. However, a student who is hospitalized or recovering from an illness or injury incurred in or aggravated during the U.S. military service has up until two years after recovering from the illness or injury to notify Yale of his or her intent to return.
5. The student cannot 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, the student will resume his or her education without repeating completed course work for courses interrupted by U.S. military service. The student will have the same enrolled status last held and will be in the same academic standing. For the first academic year in which the student returns, the student will be charged the tuition and fees that would have been assessed for the academic year in which the student left the institution. Yale may charge up to the amount of tuition and fees 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 a student who is not prepared to resume his or her studies with the same enrollment status and academic standing as when he

or she left or who will not be able to complete the program of study, Yale will undertake reasonable efforts to help the student 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 the student 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 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. To be eligible, students must be in academic good standing as a junior or second-term sophomore, as appropriate, to begin an approved term or year abroad and be able to return to enrollment at Yale in academic good standing. See “Requirements for Academic Good Standing” in section D (p. 46). 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. In general, by the time that 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. Study in an English-speaking country or participation in any other program abroad in which instruction is in English is permitted when the student articulates clear academic objectives for such a program. 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 Web site (<http://www.yale.edu/yalecollege/international/opportunities/type/study>) 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 2015–2016 are due on October 15, 2015. Applications for study in the fall term of the academic year 2016–2017 or for the full academic year 2016–2017 are due on March 5,

2016. Early applications that meet all requirements are reviewed on a rolling basis until the final deadline.

Applications for programs or universities abroad are available directly from the sponsoring institutions. Information about specific programs, including course descriptions, addresses and telephone numbers of the programs, and evaluations from past Yale participants, can be found at the Study Abroad office. 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.

A list of programs which have had the approval of the committee in the past and in which Yale students have participated with success is available on the Study Abroad Web site (<http://www.yale.edu/yalecollege/international/opportunities/type/study>) of the Center for International and Professional Experience. Students applying to enroll in programs not previously reviewed or approved by the committee may be required to furnish informational literature about the program, course syllabi, or a letter of support from a Yale faculty member familiar with the program. The committee 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 credits** 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. **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.

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. Petitions for credit toward the distributional requirements should be directed to the director of study abroad; 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 (p. 58), 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 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 (p. 59), 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 they have already taken two terms of leave, or 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 P (p. 84), 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 academic year at the Paul Mellon Centre 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 (p. 172).

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 P, Acceleration Policies (p. 84). 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 student's 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 master and dean. Such might be the case, for example, of a student who because of a leave of absence did not qualify for graduation with the class in Yale College with which he or she entered as a freshman. 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 "Leave of Absence" in section J (p. 59).

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 (p. 8).
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, 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, 472 or CGSC 473, 474), 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, 29A 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 must enroll under the undergraduate number, unless already accepted into the program for the simultaneous award of the bachelor's and master's degrees (see below).

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 and completing an additional form downloaded from the Web site of the University Registrar's Office (<http://www.yale.edu/sfas/registrar>). This latter form must be completed by the student, signed by the course instructor, and attached to a copy of the syllabus. For enrollment in a course in the Graduate School of Arts and Sciences, the form must also be signed by the director of graduate studies in the department in which the course is offered. For enrollment in a course in any of the professional schools of the University, the form 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.

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: Chemistry (p. 178); Classics (p. 192); Computer Science (p. 210); East Asian Studies (p. 233); Geology and Geophysics (p. 359); History (p. 394); Italian (p. 437); Linguistics (p. 455); Mathematics (p. 476); Molecular Biophysics and Biochemistry (p. 501); Molecular, Cellular, and Developmental Biology (p. 507); Music (p. 521); and Political Science (p. 561). The director of the Program for the Simultaneous Award of the Bachelor's and Master's Degrees is Dean George Levesque.

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.

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 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.

COURSES IN YALE SUMMER SESSION

There is no limit on the number of courses in Yale Summer Session that a student may offer toward the requirements 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 in Yale Summer Session toward such acceleration. See "Acceleration by the Early Accumulation of Thirty-Six Course Credits All Earned at Yale" in section P (p. 84).

Courses successfully completed in Yale Summer Session may, with the permission of the student's director of undergraduate studies, be counted toward the requirements of the student's major program. They may also be counted toward any of the

distributional requirements. The Credit/D/Fail option may not be used in Summer Session courses. There are no auditing privileges in Yale Summer Session.

Unless the University Registrar's Office is instructed in writing to the contrary, courses completed in Yale Summer Session will be entered on the Yale College record. Once a course in Yale Summer Session has been entered on or removed from the Yale College transcript in response to a student's request, that action cannot subsequently be reversed by the student. When a Summer Session course is entered on a student's Yale College transcript, both the course and the grade are recorded; the course may not be recorded without the grade. If a Summer Session course is entered on the Yale College transcript, it will be included in the calculation of the student's eligibility for General Honors and Distinction in the Major. For further information about Summer Session courses and transcripts, refer to the Summer Session Web site (<http://summer.yale.edu>).

YALE-IN-LONDON SUMMER PROGRAM

Courses in the summer program at the Paul Mellon Centre 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 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 "Acceleration by the Early Accumulation of Thirty-Six Course Credits All Earned at Yale" in section P (p. 84).

DIRECTED INDEPENDENT LANGUAGE STUDY

Students may study a language not taught in a department at Yale through the Directed Independent Language Study (<http://cls.yale.edu/dils>) (DILS) program offered by the Center for Language Study. 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 studying the language. Students in the program are expected to be self-motivated and to spend significant time on language 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 director of DILS, 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 each term using a nationally recognized oral proficiency examination. DILS is open to undergraduates, graduate students, and professional school students. DILS courses do not award credit, do not satisfy the Yale College language requirement, and do not appear on transcripts. Interested students should apply at <http://cls.yale.edu/dils>.

AUDITING

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

1. Students enrolled full time in Yale College or in one of the graduate or professional schools of the University may audit courses without charge. The permission of the instructor is required.
2. Members of the Yale faculty and emeritus faculty may audit courses without charge. The permission of the instructor is required.
3. Spouses or partners of full-time Yale faculty members, or of emeritus faculty, or of students enrolled full time in the University may audit courses without charge. Permission is required of the instructor and of the Dean of Special Programs.
4. Employees of the University and their spouses or partners may audit courses without charge in accordance with applicable personnel policies. Permission is required of the instructor, of the employee's supervisor, and of the Dean of Special Programs.

No other persons are permitted to audit courses in Yale College except for those accepted through the Association of Yale 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 Web site (<http://admissions.yale.edu/yale-alumni-auditing-program>).

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 visit the Yale College Special Programs Office, 55 Whitney Avenue, Suite 420.

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, which include the foreign language requirement. Upon their arrival at Yale, transfer students should consult carefully 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. Under no circumstances may a transfer student earn fewer than eighteen course credits at Yale or accelerate by the 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 evaluation 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 evaluation of transfer credits must petition the Yale College 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 (p. 33) under "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 course credit for work completed outside Yale only for studies completed before matriculation at Yale; transfer students may not receive course credit for any outside courses taken after they have enrolled in Yale College. An exception is made for transfer students who earn credit on a Year or Term Abroad. Transfer students may attend a Year or Term Abroad provided that they enroll in Yale College proper 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 freshman, sophomore, or junior years, but they must fulfill the distributional requirements for the bachelor's degree. See paragraph 1 above. Transfer students are not eligible for the award of acceleration credit or for acceleration by use of acceleration credits.
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 nondegree 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 courses for credit. 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. Like all others enrolled in Yale College, students in this program are required to comply with the academic regulations.

To qualify for the bachelor's degree through the Eli Whitney Students program, a student must successfully complete at least thirty-six course credits or the equivalent, earning at least eighteen of the thirty-six credits at Yale while enrolled in the Eli Whitney Students program. As many as eighteen course credits earned at another college or university or in the Nondegree Students program at Yale may be transferred toward the requirements for the bachelor's degree. Such credit will be awarded for academic courses that were taken at an accredited institution and that were similar in content to Yale College 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. Once a student has matriculated at Yale as a candidate for the bachelor's degree, as many as two course credits earned at another institution may be transferred to the student's Yale record, provided that the student earns no fewer than eighteen course credits at Yale. The regulations governing the transfer of such credits are given in section O, Credit from Other Universities (p. 81). The thirty-six course credits completed at Yale or elsewhere must meet the distributional requirements.

Candidates for a bachelor's degree must fulfill the requirements of one of the major programs. See the Majors in Yale College (p. 90) page and also Major Programs (p. 22) in the Undergraduate Curriculum section.

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. At the end of each term, the records of all Eli Whitney students will be reviewed; a student who does not have at least a C average for that term will be placed on Academic Warning and may not be permitted to enroll in a subsequent term.
2. **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 "Normal Program of Study" in section C (p. 44). Eli Whitney students are not eligible to enroll in freshman seminars, even during their first year in the program.
3. **Tuition and financial aid** Tuition for the 2015–2016 academic year for Eli Whitney students is \$5,300 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.

4. **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 Office of Career Strategy and fellowships through the Center for International and Professional Experience. Eli Whitney students are entitled to purchase gymnasium membership and Yale Health coverage. Students in the Eli Whitney program are not eligible for undergraduate housing and they may not serve as freshman counselors.
5. **Regulations** Eli Whitney students are governed by the academic regulations of Yale College, wherever appropriate, and by the rules contained in the *Undergraduate Regulations* (<http://yalecollege.yale.edu/campus-life/undergraduate-regulations>). In disciplinary matters, Eli Whitney students are subject to the jurisdiction of the Yale College Executive Committee.
6. **Leave of absence and withdrawal** See section J, Leave of Absence, Withdrawal, and Reinstatement (p. 59). All regular deadlines and policies apply.
7. **Year or Term Abroad** With the approval of the director of the Eli Whitney Students program, the department of their major, 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 full academic year or for either a fall or a spring term. An Eli Whitney student must comply with all deadlines and requirements of the Committee on the Year or Term Abroad. See “Year or Term Abroad” in section K (p. 65). To be eligible to apply, an Eli Whitney student must have accumulated, before enrolling abroad, at least sixteen course credits but no more than twenty-two course credits toward the 36-course-credit requirement and have a B average in course work at Yale. 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 and may not receive degree credit for any other work done at another university after their matriculation at Yale.
8. **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 can 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 on the Eli Whitney Students Program Web site (<http://admissions.yale.edu/eli-whitney>).

N. Nondegree Students Program

The Nondegree 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. This program offers nonresident students who are unable to attend college full time the opportunity to enroll in Yale College courses for credit. The Nondegree 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 others enrolled in Yale College, 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 Nondegree students. As such they are subject to Yale College undergraduate regulations as a condition of their participation in Yale's ROTC program.

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

1. **Academic requirements** Nondegree 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 nondegree 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 tenth day of the term in question. A leave of absence can 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. **Registration and enrollment** All nondegree students register for courses with the Dean of Special Programs, 55 Whitney Avenue, Suite 420, 432-2430. In general, admission to limited-enrollment courses is not available to nondegree students. Auditing is not permitted in the Nondegree Students program. Nondegree students are not eligible for enrollment in individual tutorial courses; nor are they eligible, while in the Nondegree 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 or to the particular professional school in whose courses they wish to enroll.
3. **Credit/D/Fail option** Nondegree 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 Dean of Special Programs no later than September 11 for the fall term and January 22 for the spring term. Nondegree 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 Nondegree Students program.

4. **Tuition** The tuition for nondegree students during 2015–2016 is \$5,300 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 nondegree 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 (p. 47). Note that payments completed after the registration deadline may be subject to late payment fees. Late payments will be accepted (with the addition of a late payment fee) no later than September 18, 2015, for fall 2015, and February 5, 2016, for spring 2016. 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** Nondegree 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 membership and Yale Health coverage. Nondegree students are not eligible for undergraduate housing and they may not serve as freshman counselors.
6. **Regulations** Nondegree students are governed by the academic regulations of Yale College and by the rules contained in the *Undergraduate Regulations* (<http://yalecollege.yale.edu/campus-life/undergraduate-regulations>). In disciplinary matters, nondegree 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 nondegree 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 Nondegree 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 nondegree 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 nondegree 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 nondegree student, but may be a part-time nondegree 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 nondegree

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 nondegree 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 Nondegree 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 nondegree students before their first term of enrollment at Yale.
10. **Application deadlines** Applications are due on October 1, 2015, for spring term 2016, and on June 1, 2016, for fall term 2016. Yale employees require permission of their supervisors to apply. Nondegree enrollment may begin in either the fall or the spring term.

Further information and application forms are available at the Nondegree Students Program Web site (<http://admissions.yale.edu/non-degree-students-program>).

O. 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 "Courses in Yale Summer Session" in section K (p. 65). 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 Summer Abroad program (see point 9 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 undergraduate studies in the subject of a course taken elsewhere 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, nor 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 Nondegree 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.
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 freshman year. 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.

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.
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 foreign 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.
Students receiving credit for foreign 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 points 5 and 7 above).
9. **Summer Abroad** Students who wish to receive credit for summer study abroad with designated programs must apply for approval through the Summer Abroad program. The deadline to apply for 2016 Summer Abroad credit is March 1, 2016. Information about the application process, including a list of eligible programs, is available at the Study Abroad office in the Center for International and Professional Experience, 55 Whitney Avenue, 3rd floor, and on the Study Abroad Web site (<http://www.yale.edu/yalecollege/international/opportunities/type/study>). Students receiving credit for foreign study on a Summer 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** Students admitted by transfer from another college or university may receive course credit from outside Yale only for work done before matriculation at Yale; transfer students may not receive course credit for any outside courses taken after they have enrolled in Yale College. An exception may under certain circumstances be made in the case of course credits earned by transfer students on a Year or Term Abroad. See section L, Transfer Students (p. 75). Transfer students must enroll in Yale College proper for at least four terms, and earn therein at least eighteen course credits.

11. **Online courses, internships, and the like** Course credit cannot be given for a course taken online even if it is sponsored by another university, including accredited four-year institutions granting a bachelor's degree. Course credit also 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. **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 (p. 75)—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 toward the distributional requirements only are listed without grades and with the designation “for distributional credit only.” Courses that are applied toward the requirements of a major program only 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.
13. **Acceleration** See section P, Acceleration Policies, below.

P. 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 “Courses in Yale Summer Session” and “Yale-in-London Summer Program” in section K (p. 65).
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 point 4 under “Acceleration by Use of Acceleration Credits”), 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 Freshman Web site (<http://yalecollege.yale.edu/content/acceleration>). 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 Chair of the Committee on Advanced Placement and Acceleration, University Registrar's Office, 246 Church Street, 432-2331.

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 points 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 "Leave of Absence" in section J (p. 59); a student who has received long-term loans through Yale or who is receiving financial aid from Yale should particularly note paragraph 8 under "Leave of Absence."
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 "Courses in Yale Summer Session" and "Yale-in-London Summer Program" in section K (p. 65).
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 freshman year. See section O, Credit from Other Universities (p. 81).

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 “Yale-in-London Summer Program” in section K (p. 65).

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 “Year or Term Abroad” in section K (p. 65). 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 freshman, 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 (p. 46).
11. **Enrollment after graduation as a nondegree 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 nondegree students. Because such students will have graduated, they will not be eligible for financial aid. See section N, Nondegree Students Program (p. 79).

12. **Transfer students** Students admitted by transfer from other colleges and universities are not eligible for acceleration by the use of acceleration credits.

Q. 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.)
Astronomy and Physics (B.S.)
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 Mathematics (B.A. or 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.)
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 (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 (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.)
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 (B.A. or B.S.)
Theater 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 40.

Aerospace Studies

Program chair: Colonel Phil Haun, USAF; program adviser: Major Timothy Secor, USAF; Rm. 450, 55 Whitney Ave., 432-9431; airforce@yale.edu; afrotc.yalecollege.yale.edu

The mission of Air Force Reserve Officers Training Corps (AFROTC) Detachment 009 at Yale is to develop quality leaders for the U.S. Air Force and the nation. Cadets have gone on to serve in a range of career fields, from medicine to aviation. The program offers students a training environment that instills values such as integrity, service before self, and excellence. Cadets are also involved in a variety of activities and organizations that reach out to the local community while strengthening the skills necessary for a military career. After completing all Air Force ROTC and academic degree requirements, cadets on scholarship and those in the Professional Officer Course accept a commission as a second lieutenant in the Air Force, with a minimum active-duty service commitment of four years.

Academic requirements The Aerospace Studies curriculum is organized into four main areas, including profession of arms, communication skills, leadership studies, and military and international security studies. Courses emphasize development of professional knowledge and leadership skills in the context of military service. Classes are conducted as seminars and call for active student discussion. All uniforms, textbooks, and supplies for cadets are provided by the Air Force. Enrollment in Aerospace Studies courses is not limited to cadets; courses are open to any Yale student. 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. In some cases, courses in other departments and programs may count toward both the bachelor's degree and AFROTC requirements. For example, HIST 221, Military History of the West since 1500, fulfills the first term of the 200-level AFROTC requirement and also counts toward the bachelor's degree. No course taken Credit/D/Fail may be counted toward the program in Aerospace Studies.

Cadets become involved in the management of their own cadet wing through a mandatory two-hour leadership laboratory each week. They are assigned corps positions, with increasing responsibility over their four years. In addition, students in the program participate in physical training, leadership projects, visits to Air Force

bases, orientation flights, and normal college extracurricular activities. In all, cadets can expect to dedicate six to eight hours per week to the program.

Freshmen and first-term sophomores are eligible for enrollment in the AFROTC program. Full and partial scholarships that may cover tuition, fees, books, and/or a subsistence allowance are available, with levels dependent on qualifications and other factors. Scholarships are open to both freshmen and sophomores who excel in academics and display leadership potential.

For additional information about Yale's Air Force Reserve Officers Training Corps program, visit the program's Web site (<http://afrotc.yalecollege.yale.edu>) or send questions to Major Timothy Secor at timothy.secor@yale.edu.

*** USAF 101a and USAF 102b, Foundation of the U.S. Air Force** Staff

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. o Course cr per term

*** USAF 202b, The Evolution of U.S. Air and Space Power** Phil Haun

The development and employment of American air and space power from the Korean Conflict to the present. The distinctive capabilities and functions of air and space power; Air Force heritage and leaders; continued application of communication skills. Prerequisites: USAF 101, 102, and HIST 221. 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. o Course cr

*** USAF 301a and USAF 302b, Air Force Leadership Studies** Staff

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. Prerequisite: USAF 202. 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. o Course cr per term

*** USAF 401a and USAF 402b, National Security Affairs and Preparation for Active Duty** Phil Haun

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. o Course cr per term

COURSE IN ANOTHER DEPARTMENT THAT COUNTS TOWARD AFROTC REQUIREMENTS

HIST 221a / GBL 281a, Military History of the West since 1500 Paul Kennedy

A study of the military history of the West since 1500, with emphasis on the relationship between armies and navies on the one hand, and technology, economics, geography, and the rise of the modern nation-state on the other. The coming of airpower in its varied manifestations. Also meets requirements for the Air Force and Naval ROTC programs. HU

African American Studies

Director of undergraduate studies: Erica James, Rm. 302, 81 Wall St., 432-9718 or 432-7758, erica.james@yale.edu; afamstudies.yale.edu

FACULTY OF THE DEPARTMENT OF AFRICAN AMERICAN STUDIES

Professors Elizabeth Alexander, Elijah Anderson, David Blight, Daphne Brooks, Hazel Carby, Glenda Gilmore, Jacqueline Goldsby, Emily Greenwood, Jonathan Holloway, Matthew Jacobson, Gerald Jaynes, Kobena Mercer, Christopher L. Miller, Joseph Roach, Robert Stepto, Michael Veal

Associate Professors Jafari Allen, Crystal Feimster, Anthony Reed, Edward Rugemer, Vesla Weaver

Assistant Professors Vanessa Agard-Jones, Erica James, Christopher Lebron

The African American Studies major examines, from numerous disciplinary perspectives, the experiences of people of African descent in Black Atlantic societies such as the United States, the Caribbean, and Latin America, 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 the discipline.

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.

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.

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. Pertinent regulations can be found under Two Majors (p. 69) in section K of the Academic Regulations.

Requirements of the major 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 162, which can be taken in either order; one course in the humanities relevant to African American studies; 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). During the 2015–2016 academic year AFAM 162 will be offered in the fall and AFAM 160 will be offered in the spring, an inversion of the usual sequence.

Area of concentration Students majoring in African American Studies are required to choose an area of concentration comprising 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.

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 problem and design are to be worked out in each case with a faculty adviser.

Credit/D/Fail For the class of 2017 and subsequent classes, no more than one course taken Credit/D/Fail may be counted toward the major.

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

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 12 term courses

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)

Courses

* **AFAM 008a / AFST 008a / HSAR 009a, Aesthetics and Meaning in African Arts and Cultures** Erica James

The diversity of artistic production on the African continent, both historically and materially. The creative consciousness and aesthetic values of a variety of African cultures from ancient to contemporary times. Questions that arise when writing these histories without fully taking into account concepts of "African time." HU

* **AFAM 060b / AMST 060b / HIST 016b, Significance of American Slavery** Edward Rugemer

The history of American slavery, its destruction during the nineteenth century, and its significance today. Topics include the origins of slavery, the development of racism, the transatlantic slave trade, the experience of enslavement, resistance to slavery, the abolitionist movement, the process of emancipation, and the perpetuation of slavery and other forms of unfree labor in the twenty-first century. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

AFAM 110a / AMST 161a, Freedom and Identity in Black Cultures Jafari Allen

Introduction to major themes and topics in African American experiences; basic methods of interdisciplinary analysis and interpretation in African American studies. Topics include black economic, political, and social institutions; self-identity and social status; literature, art, film, and music; and political and social issues and their relationship to changing social structures. HU, SO

AFAM 140b / AMST 211b / ENGL 293b / ER&M 210b / WGSS 211b, Race and Gender in American Literature Birgit Rasmussen

The role of literature in constructing representations of America as an idea, a nation, a colonial settlement, and a participant in world affairs. What kind of place America is and who belongs there; the consequences of America's history for its national literature. Emphasis on the ways texts represent and contest social concepts of race and gender difference. WR, HU

AFAM 160b / AMST 160b / HIST 184b, 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 162a / AMST 162a / HIST 187a, African American History from Emancipation to the Present Jonathan Holloway

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 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 189a / HSAR 374a, Black Art and Material Culture in Early Modern America Erica James

This course engages histories of black representation and artistic production by black people in the United States from the colonial period through the Harlem Renaissance. It offers a comprehensive overview and critique of black expressive forms across media, in relation to mainline discourses of American art and within the context of American economic, cultural, social, and political histories. HU

*** AFAM 202b / HIST 103Jb, Life and Writings of Frederick Douglass** David Blight

The life, times, and works of Frederick Douglass, African American abolitionist and leader of the nineteenth century. Douglass's writings, including autobiographies, oratory, and editorials, and his role as a historical actor in the antislavery and early civil rights movements. Deep inquiry into the craft of biography. WR, HU

*** AFAM 210b / AMST 445b / HIST 148Jb, Politics and Culture of the U.S. Color Line** Matthew Jacobson

The significance of race in U.S. political culture, from the “separate but equal” doctrine of *Plessy v. Ferguson* to the election of an African American president. Race as a central organizer of American political and social life. HU RP

*** AFAM 255a / HIST 139Ja, The American South, 1870 to the Present** Glenda Gilmore

A thematic approach to the history of the American South since Reconstruction. Focus on the political, social, and cultural history of a region that has undergone dramatic change. Topics include white supremacy and African American resistance, industrialization and labor activism, music and literature, the civil rights movement and the rise of the Republican South, and changing regional identity. WR, HU

*** AFAM 268a / PLSC 245a, Urban Politics and Policy** Cynthia Horan

Approaches to urban politics and political economy. Application of theories to contemporary policy issues such as policing, metropolitan disparities, and inner-city revitalization. SO

*** AFAM 270b / PLSC 280b, Poverty, Politics, and Policy in the American City** Cynthia Horan

Examination of how politics informs the formulation and implementation of policies to address urban poverty. Consideration of alternative explanations for poverty and alternative government strategies. Focus on efforts by local organizations and communities to improve their situations within the context of government actions. SO

*** AFAM 273a / EP&E 244a / SOCY 314a / WGSS 316a, Inequality in America** Vida Maralani

Introduction to the current landscape of socioeconomic inequality in the U.S. Empirical, theoretical, and methodological facets of inequalities in education, occupation, income, wealth, health, neighborhoods, and intergenerational mobility; how these intersect

with race and gender. Core questions include how different social groups fare and why, and what types of policies might address existing inequalities. WR, SO

* **AFAM 287b / AFST 412b / FREN 412b / LITR 250b, Postcolonial Theory and Literature** Christopher Miller

A survey of the principal modes of thought that have animated decolonization and life after colonialism, as seen in both theoretical and literary texts. Concentration on the British and French imperial and postcolonial contexts. Readings in negritude, orientalism, psychoanalysis, poststructuralism, and novels. Lectures in English; readings available both in French and in English translation. HU RP

* **AFAM 296a / AMST 296a / ENGL 296a / WGSS 292a, Contemporary African American Literature** Elizabeth Alexander

A survey of African American literature since 1970. Authors include Toni Morrison, Alice Walker, Rita Dove, Yusef Komunyakaa, Anna Deavere Smith, Danzy Senna, and others. Topics include black feminist literature, black gay and lesbian literature, developments in literary criticism and theory, and contemporary black drama. HU

* **AFAM 317a / ANTH 303a, Field Methods in Cultural Anthropology** Narges Erami
Exploration of the fundamentals of cultural anthropology methods. The foundations of fieldwork approaches, including methods, theories, and the problem of objectivity. SO

* **AFAM 346a / HSAR 471a, Black Atlantic Photography** Kobena Mercer
Introduction to the social and artistic history of photography in Black Atlantic contexts from the mid-nineteenth century to the present. Uses of the photographic image in shaping understandings of race relations and black identities. Codes and conventions by which photographs are evaluated in terms of truth, reflection, testimony, expressivity, and construction. HU

* **AFAM 377a / AMST 359a / FILM 424a, Urban Narratives of Injustice in *The Wire***
Hazel Carby

Narratives of injustice, crime, and the policing of citizens as represented in *The Wire*, critically acclaimed as the finest television drama ever made, plus additional readings. HU

* **AFAM 410b / AMST 310b / WGSS 410b, Interdisciplinary Approaches to African American Studies** Jafari Allen

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 437b / AMST 420b / ENGL 445b, Ralph Ellison in Context** Robert Stepto
The complete works of Ralph Ellison and related works (in various art forms) of his contemporaries, including Wright, Baldwin, Bearden, and Louis Armstrong. WR, HU

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

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** Staff

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 483b / ENGL 460a or b, Advanced Poetry Writing** Elizabeth Alexander

A seminar and workshop in the writing of verse. May be repeated for credit with a different instructor. RP

*** AFAM 491b, The Senior Essay** Erica James

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, 2685 HGS, 432-6110, daniel.magaziner@yale.edu; director of the Program in African Languages: Kiarie Wa'Njogu, 309B LUCE, 432-0110, john.wanjogu@yale.edu; www.yale.edu/macmillan/african

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*), Andrew Hill (*Anthropology*), Roderick McIntosh (*Anthropology*), Christopher L. 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*), Christopher Udry (*Economics*), 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

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 program in African Studies consists of thirteen 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 director of undergraduate studies), unless waived by examination; (3) the junior seminar on research methods, AFST 401; (4) a concentration of four term courses, selected in consultation with the director of undergraduate studies, 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) one additional course that either deepens the concentration or provides methodological tools for 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. With permission of the director of undergraduate studies, 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.

Students planning to major in African Studies should consult the director of undergraduate studies as early as possible.

Senior requirement Students are required to complete a senior essay in AFST 491, working under the guidance of a faculty adviser.

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

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.

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 (p. 535). Noncredit instruction in other African languages is available by application through the Directed Independent Language Study (<http://cls.yale.edu/dils>) program at the Center for Language Study (<http://cls.yale.edu>). Contact the director of the Program in African Languages (john.wanjogu@yale.edu) for information.

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 13 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 in area of concentration; 1 course that deepens the concentration or prepares the senior essay

Specific course required AFST 401

Senior requirement Senior essay (AFST 491)

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

African Studies Courses

* **AFST 008a / AFAM 008a / HSAR 009a, Aesthetics and Meaning in African Arts and Cultures** Erica James

The diversity of artistic production on the African continent, both historically and materially. The creative consciousness and aesthetic values of a variety of African cultures from ancient to contemporary times. Questions that arise when writing these histories without fully taking into account concepts of "African time." HU

*** AFST 015a / ENGL 015a, South African Writing after Apartheid** Staff

An introduction to creative writing published in South Africa from the end of Apartheid in 1994 to the present. Close readings of contemporary fiction with additional material drawn from popular culture, including films, magazines, and music. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

AFST 180b / ER&M 313b, Nigeria and Its Diaspora Oluseye Adesola

Nigerians in the modern diaspora, both those who endured forced migration and those who migrated voluntarily. Specific reference to the Igbos and the Yorùbás. The preservation and maintenance of Nigerian culture, history, dance, literature, traditional education, theater, politics, art, music, film, religion, and folklore, especially in African American and Nigerian American contexts. SO

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 335b / HIST 335b, 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 347a / EP&E 484a / GLBL 243a / LAST 348a / PLSC 347a, Post-Conflict Politics** David Simon

Consideration of a range of issues and challenges faced by countries emerging from domestic conflict. Focus on elements of peace-building—disarmament and demobilization, post-conflict elections, institution-building, and reconstruction—as well as modes of transitional justice and mechanisms for truth and reconciliation. SO

*** AFST 348b / MMES 291b / SOCY 232b, Islamic Social Movements** Jonathan Wyrzten

Social movement and network theory used to analyze the emergence and evolution of Islamic movements from the early twentieth century to the present. Organization, mobilization, and framing of political, nonpolitical, militant, and nonmilitant movements; transnational dimensions of Islamic activism. Case studies include the Muslim Brotherhood, Hamas, Hizbollah, Al-Qaeda, Al-Adl wa-Ihsann, and Tablighi Jama'at. SO

*** AFST 353a / MUSI 353a, Topics in World Music** Michael Veal

A critical introduction to selected cultures of world music. Specific cultures vary from year to year but generally include those of Native America, South Asia, Southeast Asia,

sub-Saharan Africa, the Middle East, and the Caribbean. Preference to Music majors according to class. HU

* **AFST 355b / ANTH 355b, China-Africa Encounters** Helen Siu

The history, effects, and implications of Chinese involvement in and with African countries over the past century. Diasporic experiences, with attention to informal economies, cultural strategies, and ethnic and religious tensions; land, finance, and infrastructure; Chinese aid and development in Africa since the late 1960s, including medical aid and charitable groups. SO

* **AFST 360a / ECON 487a / EP&E 365a / GBLB 313a / PLSC 417a, The Political Economy of AIDS in Africa** Nicoli Nattrass

The impact of and responses to the AIDS pandemic in Africa examined from a comparative perspective. Focus on South and southern Africa. Some background in social science and economics desirable. SO

* **AFST 373b / GBLB 362b / MMES 282b / SOCY 339b, Imperialism, Insurgency, and State Building in the Middle East and North Africa** Jonathan Wyrzten

The historical evolution of political order from Morocco to Central Asia in the past two centuries. Focus on relationships between imperialism, insurgency, and state building. Ottoman, European, and nationalist strategies for state building; modes of local resistance; recent transnational developments; American counterinsurgency and nation-building initiatives in the region. SO

* **AFST 389b / GBLB 186b / MMES 181b / PLSC 389b, Middle East Exceptionalism** Adria Lawrence

The Middle East and North Africa in comparative perspective. Evaluation of claims that the region's states are exceptionally violent, authoritarian, or religious. Themes include gender, Islam, nation and state formation, oil wealth, terrorism, and war. SO

* **AFST 401a, Research Methods in African Studies** Cheryl Doss

Disciplinary and interdisciplinary research methodologies in African studies, with emphasis on field methods and archival research in the social sciences and humanities. Research methodologies are compared by studying recent works in African studies.

* **AFST 412b / AFAM 287b / FREN 412b / LITR 250b, Postcolonial Theory and Literature** Christopher Miller

A survey of the principal modes of thought that have animated decolonization and life after colonialism, as seen in both theoretical and literary texts. Concentration on the British and French imperial and postcolonial contexts. Readings in negritude, orientalism, psychoanalysis, poststructuralism, and novels. Lectures in English; readings available both in French and in English translation. HU TR RP

* **AFST 430b, Language Planning in Sub-Saharan Africa** Kiarie Wa'Njogu

Examination of language policies in selected sub-Saharan African countries. Analysis of language use in different contexts; assessment of the impact of globalization on African languages. HU

* **AFST 435a / THST 335a, 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

*** AFST 447b / EP&E 271b / ER&M 271b / PLSC 447b, The Rwandan Genocide in Comparative Context** David Simon

An examination of the 1994 Rwandan genocide: historical sources of the conflict, the motivations of the killers, actions and reactions of outside actors, efforts to reconstruct a post-genocide society, and continuation of the genocidal dynamic within the Great Lakes region. Consideration of other countries in similar situations, as well as other genocides in recent decades. SO

*** AFST 449a / ENGL 449a, Challenges to Realism in Contemporary African Fiction**
Staff

Introduction to experimental African novels that challenge realist and documentary modes of representation. Topics include mythology, gender subversion, politics, the city, migration, and the self. Ways of reading African and postcolonial literature through the lenses of identity, history, and nation. WR, HU

*** AFST 464a / ECON 464a, The Economics of Africa** Cheryl Doss

Study of key microeconomic issues facing African economies and of the economic tools used to analyze such issues. Topics include infrastructure, land, agriculture, conflict, intrahousehold issues, health and education, microfinance and risk, and coping strategies. Readings from recent literature in microeconomic development. Prerequisites: intermediate microeconomics and econometrics. SO

***AFST 471a and AFST 472b, Independent Study** Staff

Independent research under the direction of a faculty member in the program on a special topic in African 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. Either term or both terms may be elected.

*** AFST 486a / HIST 388Ja, Slavery and the Slave Trade in Africa** Robert Harms

The slave trade from the African perspective. Analysis of why slavery developed in Africa and how it operated. The long-term social, political, and economic effects of the Atlantic slave trade. WR, HU

*** AFST 487a / HIST 387Ja, West African Islam: Jihad Tradition and Its Pacifist Opponents** Lamin Sanneh

The influence of Islam on state and society, and the encounters of Muslim Africans first with non-Muslim societies in Africa and then with the modern West in the colonial and postcolonial periods. Focus on Muslim religious attitudes and responses to the secular national state and to the Western tradition of the separation of church and state. WR, HU

*** AFST 490a, African Studies Colloquium** Staff

Students conduct research for the senior essay, give presentations on their research, and prepare a bibliography, a prospectus, and a draft chapter of the senior essay. Discussion of model essays and other examples of writing. HU, SO

* **AFST 491a or b, 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 Staff

A beginning course with intensive training and practice in speaking, listening, reading, and writing. Initial emphasis is on the spoken language and conversation. Credit only on completion of SWAH 120. L1 1½ Course cr

SWAH 120b, Beginning Kiswahili II Kiarie Wa'Njogu

Continuation of SWAH 110. Texts provide an introduction to the basic structure of Kiswahili and to the culture of the speakers of the language. Prerequisite: SWAH 110. L2 1½ Course cr

SWAH 130a, Intermediate Kiswahili I Staff

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 140b, Intermediate Kiswahili II Staff

Continuation of SWAH 130. After SWAH 130. L4 1½ Course cr

SWAH 150a, Advanced Kiswahili I Staff

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 160b, Advanced Kiswahili II Kiarie Wa'Njogu

Continuation of SWAH 150. After SWAH 150. L5

SWAH 170a or b, Topics in Kiswahili Literature Staff

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

Yoruba Courses

YORU 110a, Beginning Yorùbá I Staff

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. Credit only on completion of YORU 120. L1 1½ Course cr

YORU 120b, Beginning Yorùbá II Oluseye Adesola

Continuing practice in using and recognizing tone through dialogues. More emphasis is placed on simple cultural texts and role playing. Prerequisite: YORU 110. L2

1½ Course cr

YORU 130a, Intermediate Yorùbá I Staff

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 140b, Intermediate Yorùbá II Oluseye Adesola

Students are exposed to more idiomatic use of the language in a variety of interactions, including occupational, social, religious, and educational. Cultural documents include literary and nonliterary texts. After YORU 130. L4 1½ Course cr

YORU 150a, Advanced Yorùbá I Staff

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 160b, Advanced Yorùbá II Oluseye Adesola

Continuing development of students' aural and reading comprehension and speaking and writing skills, with emphasis on idiomatic usage and stylistic nuance. Study materials are selected to reflect research interests of the students. After YORU 150. L5

YORU 170a and YORU 171b, Topics in Yorùbá Literature and Culture Staff

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

YORU 180a and YORU 181b, Advanced Topics in Yorùbá Literature and Culture

Staff

Designed for students with superior proficiency in Yorùbá who have an interest in topics not otherwise covered by existing courses. Development of language proficiency to the level of an educated native speaker. Discussion of advanced readings on Yorùbá philosophy, history, literature, and culture. L5

Zulu Courses

ZULU 110a, Beginning isiZulu I Staff

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. Credit only on completion of ZULU 120. 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 Staff

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 140b, Intermediate isiZulu II Sandra Sanneh

Students read longer texts from popular media as well as myths and folktales. Prepares students for initial research involving interaction with speakers of isiZulu in South Africa and for the study of oral and literary genres. After ZULU 130. L4 1½ Course cr

*** ZULU 150a, Advanced isiZulu I** Staff

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

*** ZULU 160b, Advanced isiZulu II** Sandra Sanneh

Readings may include short stories, a novel, praise poetry, historical texts, or contemporary political speeches, depending on student interests. Study of issues of language policy and use in contemporary South Africa; introduction to the Soweto dialect of isiZulu. Students are prepared for extended research in South Africa involving interviews with isiZulu speakers. After ZULU 150. Course includes students from Cornell University via videoconference. L5

American Studies

Director of undergraduate studies: Michael Denning, 233 HGS, 432-1188,
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FACULTY ASSOCIATED WITH THE PROGRAM OF AMERICAN STUDIES

Professors Jean-Christophe Agnew (*History*), Elizabeth Alexander (*African American Studies, English*), Ned Blackhawk (*History*), David Blight (*History, African American Studies*), Daphne Brooks (*African American Studies, Theater Studies*), Hazel Carby (*African American Studies*), George Chauncey (*History*), Edward Cooke, Jr. (*History of Art*), Michael Denning (*English, Ethnicity, Race, & Migration*), Wai Chee Dimock (*English*), Kathryn Dudley (*Chair*) (*Anthropology*), John Mack Faragher (*History*), Joanne Freeman (*History*), Glenda Gilmore (*History, African American Studies*), Jacqueline Goldsby (*English, African American Studies*), Inderpal Grewal (*Women's, Gender, & Sexuality Studies*), Dolores Hayden (*Architecture*), Jonathan Holloway (*African American Studies, History*), Amy Hungerford (*English*), Matthew Jacobson (*African American Studies, History*), Kathryn Lofton (*Religious Studies*), Mary Lui (*History*), Joanne Meyerowitz (*History*), Charles Musser (*Film & Media Studies*), Stephen Pitti (*History, Ethnicity, Race, & Migration*), Sally Promey (*Divinity School*), Joseph Roach

(*English, Theater Studies*), Marc Robinson (*Theater Studies, English*), Michael Roemer (*Adjunct*) (*Film & Media Studies, Art*), Alicia Schmidt Camacho (*Ethnicity, Race, & Migration*), 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*), Michael Warner (*English*), Laura Wexler (*Women's, Gender, & Sexuality Studies*)

Associate Professors Jafari Allen (*Anthropology, African American Studies*), Crystal Feimster (*African American Studies*), Zareena Grewal (*Ethnicity, Race, & Migration*), Paul Sabin (*History, Environmental Studies*), Tisa Wenger (*Divinity School*)

Assistant Professors Laura Barraclough (*Ethnicity, Race, & Migration*), Greta LaFleur, Albert Laguna (*Ethnicity, Race, & Migration*), Dixia Ramirez (*Ethnicity, Race, & Migration*), Birgit Brander Rasmussen (*Ethnicity, Race, & Migration*), Elihu Rubin (*Architecture*), Jenifer Van Vleck (*History*)

Senior Lecturers James Berger (*English*), Ron Gregg (*Film & Media Studies*)

Lecturers Ryan Brasseaux, Christine Muller, Joel Silverman, Joseph Spooner

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 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 director of undergraduate studies. One of these four courses must address material produced before the Civil War. 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.

Area of concentration Each American Studies major selects an area of concentration, normally in the fall of the junior year, from five possible choices: (1) national formations, (2) the international United States, (3) material cultures and built environments, (4) politics and American communities, and (5) visual, audio, literary, and performance cultures. 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 may also petition the director of undergraduate studies to develop an independent concentration.

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.

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. All students writing a one-term senior essay participate in a proseminar on theory and method. To apply for admission to AMST 491, a student should submit a prospectus, signed by the faculty adviser, to the director of undergraduate studies.

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 method. 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 director of undergraduate studies.

As a multidisciplinary program, American Studies draws on the resources of other departments and programs in the University. The following list of 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.

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 freshman 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 AMST 491

Freshman Seminars

* **AMST 010b, Islam in the United States** Zareena Grewal

Introduction to ethnic studies and ethnographic film and writing through the study of Islam in the United States. The wide variety of Muslim ethnic and racial and immigrant groups in the United States and the new forms of religious life that develop from their interaction. Global and universal elements of Islam; elements that are specific to place and community, including what is American about Islam in America. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **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 freshmen. Preregistration required; see under Freshman Seminar Program. HU

* **AMST 016b / ENGL 012b, Literary Cities: New York, Chicago, San Francisco** Wai Chee Dimock

An introduction to American literature, told through the vibrant lives, ethnic diversities, and innovative genres revolving around three urban centers. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **AMST 019a / HIST 018a, Commodities as U.S. History** Matthew Jacobson
American social, cultural, and political history introduced through study of the production, distribution, and consumption of common commodities. Topics include political economy, slavery, industrialization, labor, the rise of the corporation, the growth of the administrative and regulatory state, geopolitics, foreign policy, and

cultural change. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. RP

* **AMST 060b / AFAM 060b / HIST 016b, Significance of American Slavery** Edward Rugemer

The history of American slavery, its destruction during the nineteenth century, and its significance today. Topics include the origins of slavery, the development of racism, the transatlantic slave trade, the experience of enslavement, resistance to slavery, the abolitionist movement, the process of emancipation, and the perpetuation of slavery and other forms of unfree labor in the twenty-first century. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

Gateway Courses

AMST 111b / RLST 111b / WGSS 111b, Sexuality and Religion Kathryn Lofton

The relationship between ideas about sex and ideas about religion; the interrelations of sexual and religious practices. Case studies from religious cultures in the United States. Examination of presumptive norms about sexuality, religion, and American culture.

HU

AMST 133a / ER&M 187a / HIST 107a, Introduction to American Indian History

Ned Blackhawk

Survey of American Indian history, beginning with creation traditions and migration theories and continuing to the present day. Focus on American Indian nations whose homelands are located within the contemporary United States. Complexity and change within American Indian societies, with emphasis on creative adaptations to changing historical circumstances. WR, HU

AMST 135a / HIST 127a / WGSS 200a, U.S. Lesbian and Gay History George

Chauncey

Introduction to the social, cultural, and political history of lesbians, gay men, and other socially constituted sexual minorities. Focus on understanding categories of sexuality in relation to shifting normative regimes, primarily in the twentieth century. The emergence of homosexuality and heterosexuality as categories of experience and identity; the changing relationship between homosexuality and transgenderism; the development of diverse lesbian and gay subcultures and their representation in popular culture; religion and sexual science; generational change and everyday life; AIDS; and gay, antigay, feminist, and queer movements. HU

AMST 141a / HIST 141a, The American West John Mack Faragher

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 160b / AFAM 160b / HIST 184b, 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 161a / AFAM 110a, Freedom and Identity in Black Cultures Jafari Allen

Introduction to major themes and topics in African American experiences; basic methods of interdisciplinary analysis and interpretation in African American studies. Topics include black economic, political, and social institutions; self-identity and social status; literature, art, film, and music; and political and social issues and their relationship to changing social structures. HU, SO

AMST 162a / AFAM 162a / HIST 187a, African American History from Emancipation to the Present Jonathan Holloway

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 163b / EVST 120b / HIST 120b / HSHM 204b, American Environmental History Paul Sabin

Ways in which people have shaped and been shaped by the changing environments of North America from precolonial times to the present. Migration of species and trade in commodities; the impact of technology, agriculture, and industry; the development of resources in the American West and overseas; the rise of modern conservation and environmental movements; the role of planning and impact of public policies. WR, HU

AMST 190a / HIST 112a, The Formation of Modern American Culture, 1876–1919

Jean-Christophe Agnew

An introduction to the cultural history of the United States from Reconstruction through the First World War, with special attention to the persistence of popular culture, the transformation of bourgeois culture, and the birth of mass culture during a period of rapid industrialization. HU

AMST 193b / HIST 122b, Origins of U.S. Global Power Jenifer Van Vleck

Policies, strategies, and ideas that enabled the United States to become a world power. Manifest Destiny, expansion, and empire; American exceptionalism; nationalism and internationalism; capitalism and consumer culture; technological innovation; the relation between domestic politics and U.S. foreign policy, particularly with regard to race and gender; challenges and resistance to U.S. global power. Focus on the twentieth century, with introduction to critical moments in U.S. and international history during the seventeenth through nineteenth centuries. HU

AMST 211b / AFAM 140b / ENGL 293b / ER&M 210b / WGSS 211b, Race and Gender in American Literature Birgit Rasmussen

The role of literature in constructing representations of America as an idea, a nation, a colonial settlement, and a participant in world affairs. What kind of place America is and who belongs there; the consequences of America's history for its national literature. Emphasis on the ways texts represent and contest social concepts of race and gender difference. WR, HU

*** AMST 225a / FILM 325a, American Film Comedy** Michael Roemer

A study of the great American film comedians and an investigation into the psychology of laughter. Comedians from Chaplin and Keaton to the Marx brothers and Fields examined against a background of European comedy. Comic form and technique and their relevance to the American scene. Not a history of American film comedy. Priority

to juniors and seniors majoring in American Studies or in Film & Media Studies. HU
RP

* **AMST 257b / ENGL 325b, 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** Michelle Morgan
The idea of wilderness in American history, art, film, public policy, and literature, from the Puritans to the present. Authors include Thoreau, Faulkner, Jack London, Mary Rowlandson, Aldo Leopold, and Rachel Carson. A weekend field trip is held early in the term. HU

AMST 261b / ENGL 291b, The American Novel since 1945 Amy Hungerford
American fiction; works by Richard Wright, Flannery O'Connor, Patricia Highsmith, Vladimir Nabokov, Jack Kerouac, Philip Roth, Marilynne Robinson, Toni Morrison, Cormac McCarthy, Alison Bechdel, and Junot Diaz. HU

AMST 272a / ER&M 282a / HIST 183a / WGSS 272a, Asian American History, 1800 to the Present Mary Lui
An introduction to the history of East, South, and Southeast Asian migrations and settlement to the United States from the late eighteenth century to the present. Major themes include labor migration, community formation, U.S. imperialism, legal exclusion, racial segregation, gender and sexuality, cultural representations, and political resistance. HU

AMST 282a / ENGL 282a, American Literature from the Civil War to World War I Caleb Smith
A survey of American literature from the late nineteenth century to the early twentieth. Social protest, literary experimentation, and avant-garde aesthetics. Readings may include works by Twain, DuBois, James, Stein, Williams, and Faulkner. HU

AMST 284b / ER&M 217b, Introduction to Latino/a Studies Albert Laguna
Themes and issues that have shaped the experiences of Latino/a populations in the United States explored within an interdisciplinary and hemispheric framework. Relations between the United States and Latin America; the history of ethnic labels; the formation of transnational communities and identities; the politics of language and bilingualism; race, class, and ethnicity; and gender and sexuality. HU

* **AMST 289b, History of Housing in America** Staff
Introduction to political, economic, and cultural trends that have shaped housing in American cities and suburbs since the nineteenth century. Focus on housing reform, housing policy, and the physical spaces in which class, race, and gender identities are constructed and contested. Topics include tenement reform, suburbanization, urban renewal, public housing, homelessness, and New Urbanism. HU

* **AMST 296a / AFAM 296a / ENGL 296a / WGSS 292a, Contemporary African American Literature** Elizabeth Alexander

A survey of African American literature since 1970. Authors include Toni Morrison, Alice Walker, Rita Dove, Yusef Komunyakaa, Anna Deavere Smith, Danzy Senna, and others. Topics include black feminist literature, black gay and lesbian literature, developments in literary criticism and theory, and contemporary black drama. HU

Junior Seminars

* **AMST 306a / FILM 469a, The Films of Martin Scorsese** Michael Kerbel

Close analysis of Scorsese's films, with attention to his themes and styles and to ways in which his works have assimilated literary and cinematic influences, reflected their eras, and influenced other directors. Scorsese's work examined in the context of film history, and of U.S. culture and history, from the 1960s to the present. HU RP

* **AMST 307b, Sports, Civil Rights, and American Leadership** Joseph Spooner

Relations among sports, civil rights movements, and the evolution of American leadership values in the twentieth century. The American sports hero and the struggle for equality of race, gender, and sexual orientation; the cultural effects of major sports phenomena on ideas of leadership and social change. Attention to intellectual and cultural history, literature, and film. Case studies based on key sporting figures and events.

* **AMST 310b / AFAM 410b / WGSS 410b, Interdisciplinary Approaches to African American Studies** Jafari Allen

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 315b, Colonial Visions and Contemporary Revisions** Birgit Rasmussen

American literature from the colonial period paired with contemporary texts to examine how contemporary writers use, critique, revise, or speak back to colonial narratives. Contemporary authors include Eduardo Galeano, Toni Morrison, and Arthur Miller, who revisit histories of conquest, enslavement, and settler colonialism. HU RP

* **AMST 335a, Introduction to Native American and Indigenous Literatures** Birgit Rasmussen

Historical survey of literature in the Americas from the pre-Columbian era to the present, with a focus on the past few centuries of literary production in North America. Ways in which texts relate to each other across time and space, as well as to American literature and critical theory more generally. Genres include the novel, poetry, the graphic manuscript, literary criticism, and performance literature such as music, spoken word, and film. HU

* **AMST 344b / ENGL 433b, The Nonhuman in Literature since 1800** Wai Chee Dimock

Nonhuman life forms in fiction and poetry from the nineteenth century to the twenty-first, including plants and animals, monsters and viruses, intelligent machines, and extraterrestrial aliens. The complexity and variety of nonhuman ecology. WR, HU

AMST 351b / FILM 321b, Hollywood in the Twenty-First Century Ronald Gregg
Examination of how globalization and the global success of American films have affected Hollywood film production, stardom, distribution, and exhibition, as well as the aesthetics of film image, sound, and narration. Topics also include the effects of new digital technologies on film aesthetics, spectacle, spectatorship, and exhibition, and the responses of independent and other national cinemas to Hollywood's hegemony. 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 359a / AFAM 377a / FILM 424a, Urban Narratives of Injustice in *The Wire***
Hazel Carby
Narratives of injustice, crime, and the policing of citizens as represented in *The Wire*, critically acclaimed as the finest television drama ever made, plus additional readings. HU

* **AMST 370a / THST 380a, The History of Dance** Jessica Berson
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

* **AMST 381a / ARCH 351a, Poets' Landscapes** Dolores Hayden
Introduction to techniques poets have used to ground their work in the landscapes and buildings of American towns and cities including Chicago, New York, and Los Angeles. Attention to poems from a national automotive landscape as well as narrative poems about cities. Writing exercises in different poetic forms; readings from the works of Dickinson, Frost, Bishop, Lowell, Wilbur, Dickey, Pinsky, Cervantes, and Merrill. WR, HU

* **AMST 382b, Culture of the Early Cold War** Joel Silverman
U.S. history and culture from the end of World War II through the 1950s. Ways in which Americans made sense of their world. The formation of American identity after World War II, with emphasis on the construction of gender identity. Texts include novels, short stories, essays, film, advertisements, and music. HU

* **AMST 385b, Trauma in American Film and Television** Christine Muller
Origins, multiple meanings, and influence of the notion of trauma in contemporary American culture. Relations between theories of popular culture and of trauma, particularly in discussions of war, social upheaval, and September 11, 2001. The conditions and implications of engaging trauma through everyday entertainment such as film and television; the ethics of representation. HU

Senior Seminars

* **AMST 402a / ANTH 302a / FILM 324a / WGSS 380a, Gender and Sexuality in Media and Popular Culture** Vanessa Agard-Jones and Laura Wexler
Investigation of visual media and popular culture in the United States and transnationally. Gender, race, class, and sexuality in relation to the production,

circulation, consumption, and reception of media culture. Focus on theories of media and the visual. Significant lab component in which students use media technologies to make and illustrate theoretical arguments. HU

* **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 406b, 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 410b / WGSS 409b, 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 411a, Introduction to Documentary Studies** Matthew Jacobson

An introduction to documentary film, photography, and radio for students interested in doing documentary work, as well as for those who simply wish to study the history of the documentary as a cultural form. HU RP

* **AMST 413a, Planning Chicago** Chloe Taft

Chicago as central to the American economy and geography, national policymaking and demographic shifts, and our cultural imagination. Contemporary and historical urban plans and policies, from nineteenth-century efforts to reverse the flow of the Chicago River to recent proposals for the Obama Presidential Library. Topics include City Beautiful, public housing, urban renewal, immigration, creative placemaking, postindustrial redevelopment, and policing. SO

* **AMST 414a / ENGL 440a, Poetry and Debates on the Value of Arts and Humanities**

James Berger

Attacks on and defenses of poetry in the broadest sense (as culture, the aesthetic, the humanities) from Plato to contemporary debates over the proper focus of education. The value of poetry in terms of knowledge claims, moral impact, economic utility, and other categories particular to artistic production and reception. WR, HU

* **AMST 415a / ITAL 308a, The Worlds of Antonio Gramsci** Michael Denning

Study of Antonio Gramsci (1891–1937), the Italian intellectual and Marxist thinker. Engagement with his thought and works, particularly the *Prison Notebooks*. Introduction to his world and his century, including modernism and Fordism, the worldwide diaspora of Italian migrants, the revolutionary upheavals of 1917–1919, the rise of fascism and communism, and the "new lefts" of the second half of the twentieth century. HU

- * **AMST 420b / AFAM 437b / ENGL 445b, Ralph Ellison in Context** Robert Stepto
The complete works of Ralph Ellison and related works (in various art forms) of his contemporaries, including Wright, Baldwin, Bearden, and Louis Armstrong. WR, HU
- * **AMST 422a / ER&M 435a / HIST 151Ja, 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 425b / ENGL 430b, American Culture and the Rise of the Environment**
Michael Warner
U.S. literature from the late eighteenth century to the Civil War explored in the context of climate change. Development of the modern concept of the environment; the formation and legacy of key ideas in environmentalism; effects of industrialization and national expansion; utopian and dystopian visions of the future. WR, HU
- * **AMST 427a, Ritual and American Culture** Christine Muller
Ritual—from daily activities to rites of passage to sacred acts—as active participation in specifically structured kinds of ways and as a unique mode by which culture is both articulated and critiqued. Interdisciplinary theory and case studies from American culture used to concretize and complicate conceptions of ritual while demystifying the operations of cultural power. Thinkers such as Freud, Durkheim, and Catherine Bell; case studies include funeral traditions, prison tattoos, and Thanksgiving Day parades.
SO
- * **AMST 433b, American Wastelands and Political Ecology** Chloe Taft
Plans for the rehabilitation and reuse of natural and built environments in contemporary America placed in cultural, historical, ecological, and political contexts. Readings from anthropology, environmental studies, history, political ecology, cultural geography, and urban planning. Topics include brownfield redevelopment, environmental justice, heritage tourism, "ruin porn," fracking, meth labs, and casinos.
- * **AMST 435b / ANTH 366b, Anthropology of 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 441b / ER&M 370b / HIST 130Jb, 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 445b / AFAM 210b / HIST 148Jb, Politics and Culture of the U.S. Color Line**
Matthew Jacobson
The significance of race in U.S. political culture, from the "separate but equal" doctrine of Plessy v. Ferguson to the election of an African American president. Race as a central organizer of American political and social life. HU RP

* **AMST 457b / HIST 113Jb, Cultural Capital: New York in the Twentieth Century**

Jean-Christophe Agnew

An interdisciplinary study of New York City as a global cultural capital in the twentieth century. Social, political, and economic forces shaping the principal institutions of the city's patrician, popular, and mass cultures. The formation of identifiably "New York" styles in the arts, architecture, photography, literature, and film. The changing geography of cultural creation, reproduction, and distribution in the city. WR, HU

* **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

Special Projects and Senior Project

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

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** Michael Denning

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** Najwa Mayer

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: Kalyanakrishnan Sivaramakrishnan, Rm. 128, 10 Sachem St., 432-3684, kalyanakrishnan.sivaramakrishnan@yale.edu; anthropology.yale.edu

FACULTY OF THE DEPARTMENT OF ANTHROPOLOGY

Professors Richard Bribiescas, Richard Burger, † Michael Dove, Kathryn Dudley, J. Joseph Errington, Eduardo Fernandez-Duque, † Inderpal Grewal, Andrew Hill, Marcia Inhorn, William Kelly, Paul Kockelman, Roderick McIntosh, Catherine Panter-Brick, Eric Sargis, † James Scott, Helen Siu, Kalyanakrishnan Sivaramakrishnan, Anne Underhill (*Chair*), Claudia Vaggia, David Watts, † Harvey Weiss

Associate Professors Jafari Allen, Erik Harms, William Honeychurch, Karen Nakamura, Douglas Rogers

Assistant Professors Oswaldo Chinchilla, Narges Erami, Karen Hébert, Louisa Lombard, Brian Wood

Senior Lecturer † Carol Carpenter

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

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 Yale 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, a senior essay course, three advanced courses (numbered ANTH 300–470 or 473–490, not including a senior essay seminar), and one elective. 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.

Three term courses related to anthropology may be selected from other departments, with approval by the director of undergraduate studies. 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 (p. 241), Geology and Geophysics (p. 359), Psychology (p. 582), and Forestry & Environmental Studies (p. 342); cognates for sociocultural anthropology can be found in Sociology (p. 611), American Studies (p. 107), History (p. 394), 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.

With permission of the director of undergraduate studies, students may apply up to four 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 (p. 65) or through summer study at another college or university.

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

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

Senior essay 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 director of undergraduate studies 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.

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); up to 3 cognate courses in other depts or programs with DUS approval

Senior requirement Senior essay in advanced sem or ANTH 491

Courses

ANTH 110a, An Introduction to Cultural Anthropology Louisa Lombard
 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

Anthropology: Sociocultural

ANTH 116a, Introduction to Biological Anthropology David Watts
 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

Anthropology: Biological

ANTH 132b, Sex, Love, and Reproduction Eduardo Fernandez-Duque and Claudia Valeggia

Introduction to the scientific study of sex in humans. Basic principles of evolutionary biology; genetic, physiological, ecological, social, and behavioral aspects of sex in humans; topics relevant to human sexuality today. Examples drawn primarily from traditional and modern human societies, with some attention to data from studies of nonhuman primates. SC

ANTH 169a / WGSS 169a, Anthropological Approaches to Sex Karen Nakamura
 The analytical concept of sex explored using theories and methods from archaeology and from biological, sociocultural, and linguistic anthropology. Sexual morphology and behavior; constructions of sex and gender; gendered violence, power, and language; kinship and mating. SO

ANTH 170b, Chinese Culture, Society, and History Helen Siu

Anthropological explorations of basic institutions in traditional and contemporary Chinese society. Topics include kinship and marriage, religion and ritual, economy and social stratification, state culture, socialist revolution, and market reform. SO

Anthropology: Sociocultural

ANTH 171b / ARCG 171b, Great Civilizations of the Ancient World Thomas Fenn

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

Anthropology: Archaeology

ANTH 172a / ARCG 172a, 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, Pilttdown 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

Anthropology: Archaeology

ANTH 182a, Primate Ecology and Social Behavior 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. SO

Anthropology: Biological

ANTH 201b, Postwar Vietnam Erik Harms

Vietnamese society since the end of the Vietnam War in 1975. Focus on the effect of economic and political changes on cultural and social life. The challenges of postwar socialism; economic renovation; the intersection of market-oriented socialism with class dynamics, urbanization, gender, health care, and ritual life. SO

ANTH 205b, 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. SO

ANTH 209a, Anthropology of the Former Soviet Union and Eurasia Douglas Rogers

Survey of transformations in Eurasia and the former Soviet Union from the 1970s to the present. Transformations in politics, culture, religion, gender, consumption patterns, national identity, natural resources, and territorial disputes; interconnections among these issues. Changes in Eurasia viewed as windows onto global transformations of knowledge, power, and culture in the early twenty-first century. SO

Anthropology: Sociocultural

ANTH 230a / WGSS 230a, Evolutionary Biology of Women's Reproductive Lives

Claudia Valeggia

Evolutionary and biosocial perspectives on female reproductive lives. Physiological, ecological, and social aspects of women's development from puberty through menopause and aging, with special attention to reproductive processes such as pregnancy, birth, and lactation. Variation in female life histories in a variety of cultural and ecological settings. Examples from both traditional and modern societies. SC

ANTH 231a, Introduction to Linguistic Anthropology Paul Kockelman

Critical approaches to popular culture in Africa and African history. Questions include what "popular" means in popular culture; who becomes the "popular" and under what conditions; how forms of popular culture comment on social experience; and what happens when those forms are co-opted. Case studies include the reception of soap operas in Egypt, the ambiguity of political authority in Cameroonian cartoons, and the global aspirations of Tanzanian barbershop owners. Forms of popular culture that intersect and overlap in and around southern Africa's mines and in the context of informal urban economies. SO

* **ANTH 234b / WGSS 234b, Disability and Culture** Karen Nakamura

Exploration of disability from a cross-cultural perspective, using examples from around the globe. Disability as it relates to identity, culture, law, and politics. Case studies may

include deafness in Japan, wheelchair mobility in the United States, and mental illness in the former Soviet republics. SO RP

Anthropology: Sociocultural

ANTH 242b, Human Evolutionary Biology and Life History Claudia Vaggia

The range of human physiological adaptability across environments and ecologies. Effects of energetic constraints on growth, reproduction, and behavior within the context of evolution and life history theory, with special emphasis on traditional non-Western societies. SC, SO

Anthropology: Biological

ANTH 254a, Japan: Culture, Society, Modernity William Kelly

Introduction to Japanese society and culture. The historical development of Japanese society; family, work, and education in contemporary Japan; Japanese aesthetics; and psychological, sociological, and cultural interpretations of Japanese behavior. WR, SO

Anthropology: Sociocultural

* **ANTH 255b / ARCG 255b / LAST 255b, Inca Culture and Society** Richard Burger

The history and organization of the Inca empire and its impact on the nations and cultures it conquered. The role of archaeology in understanding the transformation of Andean lifeways; the interplay between ethnohistoric and archaeological approaches to the subject. SO

ANTH 264a / ARCG 264a, 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 267b / ARCG 267b, Human Evolution Andrew Hill

Examination of the fossil record of human evolution, including both paleontological and archaeological evidence for changes in hominid behavior during the Pleistocene. Prerequisite: an introductory course in biological anthropology or biology. SO

Anthropology: Biological

ANTH 271a / ARCG 271a, Human Ecology Brian Wood

Introduction to ways in which people use and relate to their physical and social environments in both the past and the present. Adaptations underlying humanity's unique ecological niche; cultural diversity in subsistence and resource use; population growth and regulation; anthropogenic evolutionary and ecological change. SO

Anthropology: Biological

ANTH 280b, Evolution of Primate Intelligence David Watts

Discussion of the extent and evolutionary origins of cognitive abilities in primates (prosimians, monkeys, apes, and humans). Topics include the role of ecological and social factors as evolutionary forces; "ape language" studies; and whether any nonhuman primates possess a "theory of mind." SO

Anthropology: Biological

ANTH 294b / ARCG 294b, The Ancient Maya Oswaldo Chinchilla Mazariegos

Introduction to the archaeological study of ancient Maya civilization in southern Mexico and northern Central America. Maya origins and modes of adaptation to

a tropical forest environment; political history of the Classic Maya and competing theories about their collapse; overviews of Maya art, calendar, and writing. SO
Anthropology: Archaeology

* **ANTH 301a, Foundations of Modern Archaeology** Richard Burger
Discussion of how method, theory, and social policy have influenced the development of archaeology as a set of methods, an academic discipline, and a political tool. Background in the basics of archaeology equivalent to one introductory course is assumed. SO

* **ANTH 302a / AMST 402a / FILM 324a / WGSS 380a, Gender and Sexuality in Media and Popular Culture** Vanessa Agard-Jones and Laura Wexler
Investigation of visual media and popular culture in the United States and transnationally. Gender, race, class, and sexuality in relation to the production, circulation, consumption, and reception of media culture. Focus on theories of media and the visual. Significant lab component in which students use media technologies to make and illustrate theoretical arguments. HU
Anthropology: Sociocultural

* **ANTH 303a / AFAM 317a, Field Methods in Cultural Anthropology** Narges Erami
The fundamentals of cultural anthropology methods. The foundations of fieldwork approaches, including methods, theories, and the problem of objectivity. WR, SO
Anthropology: Sociocultural

* **ANTH 308a / WGSS 308a, Queer Ethnographies** Karen Nakamura
Exploration of both classic and contemporary ethnographies of gender and sexuality. Emphasis on understanding anthropology's contribution to and relationship with gay and lesbian studies and queer theory. SO RP
Anthropology: Sociocultural

* **ANTH 311b, Anthropological Theory** Narges Erami
Key texts in the theoretical development of sociocultural anthropology. Theorists include Emile Durkheim, Marcel Mauss, A. R. Radcliffe-Brown, Bronislaw Malinowski, E. E. Evans-Pritchard, Claude Lévi-Strauss, Mary Douglas, Clifford Geertz, Sherry Ortner, Michele Rosaldo, and Talal Asad. SO
Anthropology: Sociocultural

ANTH 316Lb / ARCG 316Lb, Introduction to Archaeological Laboratory Sciences
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.
Anthropology: Archaeology

* **ANTH 320b / ARCG 320b / EVST 321b / NELC 320, From Babylon to Bush** Harvey Weiss
Analysis of Mesopotamian transformations from the earliest agriculture villages to the earliest cities, states, and civilization, to the earliest empires, as well as the region-wide collapses that punctuated these developments. Forces that drove these uniquely early Mesopotamian developments. Essential archaeological questions, including why each transformation happened, developed, and evolved. The end of the Ottoman empire and the British (1917) and American (1991, 2003) invasions. HU, SO

Anthropology: Archaeology

* **ANTH 321b / MMES 321b / WGSS 321b, Middle East Gender Studies** Marcia Inhorn

The lives of women and men in the contemporary Middle East explored through a series of anthropological studies and documentary films. Competing discourses surrounding gender and politics, and the relation of such discourse to actual practices of everyday life. Feminism, Islamism, activism, and human rights; fertility, family, marriage, and sexuality. SO

* **ANTH 333a, Bilingualism in Social Context** J. Joseph Errington

The linguistic phenomenon of bilingualism presented through broad issues in social description inseparably linked to it: growth and change in bilingual communities; bilingual usage, social identity, and allegiance; and interactional significances of bilingual speech repertoire use. SO

Anthropology: Linguistic

* **ANTH 346a, 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

Anthropology: Sociocultural

* **ANTH 355b / AFST 355b, China-Africa Encounters** Helen Siu

The history, effects, and implications of Chinese involvement in and with African countries over the past century. Diasporic experiences, with attention to informal economies, cultural strategies, and ethnic and religious tensions; land, finance, and infrastructure; Chinese aid and development in Africa since the late 1960s, including medical aid and charitable groups. SO

* **ANTH 360a / MMES 111a, Representing Iran** Narges Erami

Major themes in Iranian history and culture used as a critical framework for understanding challenges that face Iran today. Examination of Western production of knowledge about Iran. Topics include local and oral history, revolutions, Islam and secularism, democracy and theocracy, and the role of cinema. SO

Anthropology: Sociocultural

* **ANTH 366b / AMST 435b, Anthropology of 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

Anthropology: Sociocultural

* **ANTH 370b, Anthropology of Information** Paul Kockelman

Semiotic technologies, with a focus on the digital and computational mediation of meaning. Relations between meaning and information, between interpretation and computation, and between interaction and infrastructure. Readings from media studies, cybernetics, computer science, semiotics, anthropology, and critical theory. SO

Anthropology: Linguistic

* **ANTH 380a / LING 219a, The Evolution of Language and Culture** Claire Bowers
Introduction to cultural and linguistic evolution. How diversity evolves; how innovations proceed through a community; who within a community drives change; how changes can be "undone" to reconstruct the past. Methods originally developed for studying evolutionary biology are applied to language and culture. WR, SO

* **ANTH 382a / EVST 345a / F&ES 384a, Environmental Anthropology** Michael Dove
History of the anthropological study of the environment: nature-culture dichotomy, ecology and social organization, methodological debates, politics of the environment, and knowing the environment. SO

Anthropology: Sociocultural

* **ANTH 385a / ARCG 385a, 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
Anthropology: Archaeology

* **ANTH 386b / GLBL 393b, Humanitarian Interventions: Ethics, Politics, and Health**
Catherine Panter-Brick

Analysis of humanitarian interventions from a variety of social science disciplinary perspectives. Issues related to policy, legal protection, health care, morality, and governance in relation to the moral imperative to save lives in conditions of extreme adversity. Promotion of dialogue between social scientists and humanitarian practitioners. SO

Anthropology: Sociocultural

* **ANTH 388b, Politics of Culture in Southeast Asia** Erik Harms
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

Anthropology: Sociocultural

* **ANTH 397b / ARCG 397b, Archaeology of East Asia** Anne Underhill
Introduction to the findings and practice of archaeology in China, Japan, Korea, and southeast Asia. Methods used by archaeologists to interpret social organization, economic organization, and ritual life. Attention to major transformations such as the initial peopling of an area, establishment of farming villages, the development of cities, interregional interactions, and the nature of political authority. SO

Anthropology: Archaeology

* **ANTH 401b, Meaning and Materiality** Paul Kockelman
The interaction of meaning and materiality. Relations among significance, selection, sieving, and serendipity explored through classic work in biosemiosis, technocognition, and sociogenesis. Sources from sociocultural and linguistic anthropology, philosophy, and cognitive sciences such as psychology. SO

Anthropology: Linguistic

* **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

Anthropology: Sociocultural

* **ANTH 410b / ARCG 410b, Ethnohistory and Archaeology** Roderick McIntosh
 Review of the major problems and methodologies associated with the use of ethnohistory by archaeologists. The construction of a historical imagination. Sources include colonial and “visitor” documents, peoples’ written descriptions of themselves, oral traditions, classic ethnographies, and writings in art history. SO
 Anthropology: Archaeology

* **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
 Anthropology: Linguistic

* **ANTH 414a, Hubs, Mobilities, and World Cities** Helen Siu
 Analysis of urban life in historical and contemporary societies. Topics include capitalist and postmodern transformations; class, gender, ethnicity, and migration; and global landscapes of power and citizenship. SO RP

* **ANTH 424b, Political Anthropology of Russia and Its Neighbors** Douglas Rogers
 Consideration of political life in the territory of the former Soviet Union, with an emphasis on fieldwork-based studies. Topics include mafias, petrostates, wars and conflict, clan-based politics, protest movements, religion, power and gender, corruption, legacies of the Soviet period, and the power of corporations. Prerequisite: a course in the social sciences or in Russian/Eurasian studies. SO

* **ANTH 429a / ARCG 429a, Integrating Remote Sensing in Archaeology** William Honeychurch and Andrew Womack
 Introduction to satellite and geophysical remote sensing in anthropology. Focus on integrating this data with other techniques and databases for manipulation and application to archaeological research. Some experience with geographical information systems (GIS) helpful but not required. SO

* **ANTH 432b, Politics of Language** J. Joseph Errington
 Language difference and language inequality as symbols and shapers of political dynamics and social change in plural societies. Comparative, theoretical, and ethnographic approaches to the politics of sociolinguistic difference, with case studies focused on specific issues. Topics include “problems” of substandard languages, bilingual identities, ethnic and national identity, and globalization and language shift. SO RP

Anthropology: Sociocultural

* **ANTH 438b, Culture, Power, Oil** Douglas Rogers
 The production, circulation, and consumption of petroleum as they relate to globalization, empire, cultural performance, natural resource extraction, and the nature of the state. Case studies include the United States, Saudi Arabia, Nigeria, Venezuela, and the former Soviet Union. SO
 Anthropology: Sociocultural

* **ANTH 447b / ARCG 447b, Hunter-Gatherers** Brian Wood

Survey of the ecology, economics, and political and social organization of contemporary hunter-gatherers, and review of anthropological inquiry into foraging societies.

Approaches to understanding hunter-gatherer variability and their influence on the study of human evolution and prehistory. SO

Anthropology: Sociocultural

* **ANTH 450b / ARCG 450b, Analysis of Lithic Technology** Oswaldo Chinchilla Mazariegos

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

Anthropology: Archaeology

* **ANTH 451a / WGSS 431a, 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

Anthropology: Sociocultural

* **ANTH 453b, Health Disparities and Health Equity** Catherine Panter-Brick

A biocultural perspective on debates in medical anthropology and global health that focus on health disparities and equity. The intersection of biological and cultural issues in matters of health research and intervention. Application of theoretical frameworks to case studies in global health inequality. SO

* **ANTH 455a / WGSS 459a, Masculinity and Men's Health** Marcia Inhorn

Ethnographic approaches to masculinity and men’s health around the globe. Issues of ethnographic research design and methodology; interdisciplinary theories of masculinity; contributions of men’s health studies from Western and non-Western sites to social theory, ethnographic scholarship, and health policy. SO RP

Anthropology: Sociocultural

* **ANTH 456a / ARCG 456a, Reconstructing Human Evolution: An Ecological Approach** Andrew Hill

Methods for obtaining data relevant to ecological factors that have affected human evolutionary change, such as changes in climate, competition with other animals, and availability and kinds of food supply. Evaluation of techniques for obtaining ecological data in such fields as geology, paleobotany, and paleozoology. Ethnographic, primatological, and other biological models of early human behavior. SO

Anthropology: Biological

* **ANTH 457b, Topics in Evolutionary Theory** Andrew Hill

Classic and current literature in theoretical evolutionary biology. Intensive training in critical analysis of theoretical concepts and in scientific writing. Recommended preparation: ANTH 267. SO

Anthropology: Sociocultural

Anthropology: Biological

ANTH 458b, Demography and Human Experience Brian Wood

Introduction to the study of the growth, decline, composition, migration, and interaction of human populations. Methods for measuring, visualizing, and analyzing population processes. Theory from disciplines such as history, social science, public health, and environmental science used to explore the ways in which individual human experience reflects and contributes to population dynamics. SO

Anthropology: Sociocultural

*** ANTH 471a or b, 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 473b / ARCG 473b / EVST 473b, Abrupt Climate Change and Societal Collapse** Harvey Weiss

The coincidence of societal collapses throughout history with decadal and century-scale drought events. Challenges to anthropological and historical paradigms of cultural adaptation and resilience. Examination of archaeological and historical records and high-resolution sets of paleoclimate proxies. HU, SO

Anthropology: Sociocultural

*** 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: Daniel Spielman, Rm. 340, 17 Hillhouse Ave., 436-1264, daniel.spielman@yale.edu; senior coordinator: Andrew Barron, 24 Hillhouse Ave., 432-0634, andrew.barron@yale.edu; associate director of undergraduate studies: Sekhar Tatikonda, Rm. 338, 17 Hillhouse Ave., 432-4714, sekhar.tatikonda@yale.edu

FACULTY ASSOCIATED WITH THE PROGRAM OF APPLIED MATHEMATICS

Professors Andrew Barron (*Statistics*), Donald Brown (*Economics, Mathematics*), Joseph Chang (*Statistics*), Ronald Coifman (*Mathematics*), Stanley Eisenstat (*Computer Science*), Michael Fischer (*Computer Science*), Igor Frenkel (*Mathematics*), Roger Howe (*Mathematics*), Peter Jones (*Mathematics*), A. Stephen Morse (*Electrical Engineering*), David Pollard (*Statistics*), Nicholas Read (*Physics, Applied Physics*), Vladimir Rokhlin (*Computer Science, Mathematics*), Herbert Scarf (*Emeritus*) (*Economics*), Peter Schultheiss (*Emeritus*) (*Electrical Engineering*), Martin Schultz (*Emeritus*) (*Computer*

Science), Mitchell Smooke (*Mechanical Engineering, Applied Physics*), Daniel Spielman (*Computer Science*), Van Vu (*Mathematics*), Günter Wagner (*Ecology & Evolutionary Biology*), Xiao-Jing Wang (*Neurobiology*), John Wettlaufer (*Geology & Geophysics, Mathematics, Physics*), Huibin Zhou (*Statistics*), 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*)

J. W. Gibbs Assistant Professors Xiuyuan Cheng, Alexander Cloninger, Manas Rachh, Guy Wolf

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 applications, there are a few essential 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 (p. 210), Mathematics (p. 476), Statistics (p. 639), and Engineering and Applied Science (p. 276). Courses applying mathematics may be drawn from participating programs in Applied Physics (p. 134); Astronomy (p. 160); the biological sciences, including Ecology and Evolutionary Biology (p. 241), Molecular Biophysics and Biochemistry (p. 501), and Molecular, Cellular, and Developmental Biology (p. 507); Chemistry (p. 178); Computer Science (p. 210); Economics (p. 249); the various programs in engineering, including Biomedical (p. 167), Chemical (p. 173), Electrical (p. 265), Environmental (p. 299), and Mechanical (p. 488) Engineering; Geology and Geophysics (p. 359); Mathematics (p. 476); Physics (p. 551); Political Science (p. 561); and Statistics (p. 639). The Applied Mathematics degree program requires a three-course concentration in a field in which mathematics is used.

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 or CPSC 112.

Details of individual programs must be worked out in consultation with the director of undergraduate studies, whose signed permission is required.

Requirements of the major for 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 (STAT 241 or 238)
3. A course in data analysis (STAT 361 or 230)
4. A course in discrete mathematics (AMTH 244 or CPSC 202)
5. Courses in at least three of the following areas: (a) optimization: AMTH 437; (b) probability and statistics: STAT 242, 251, 312, 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, 442, STAT 364; (h) data mining and machine learning: STAT 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, PHYS 344, 401, 402, 410, 420, 430, 440, 442, 460, APHY 439, 448; (k) engineering: MENG 280, 285, 361, 383, 463, 469, CENG 301, 315
6. At least three courses in a field of concentration involving the application of mathematics to that field, at least two of which are advanced courses. 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. degree below. Details of a student's program to satisfy the concentration requirement must be worked out in consultation with, and approved by, the director of undergraduate studies
7. Senior seminar (AMTH 490) or special project completed during senior year (AMTH 491)

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 director of undergraduate studies

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.

REQUIREMENTS OF THE MAJOR

Prerequisites MATH 120 or ENAS 151, and MATH 222 or 225, or equivalents; ENAS 130 or CPSC 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; STAT 241 or 238; STAT 361 or 230; AMTH 244 or CPSC 202; *B.S.* – same, plus MATH 300 or 301

Distribution of courses *B.A.* – at least 3 courses in a field of concentration concerning the application of math to that field, at least 2 of them advanced; 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)

Introductory Courses

* **AMTH 160b / MATH 160b, The Structure of Networks** Staff

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 / MATH 244a, Discrete Mathematics Asaf Ferber

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 247b / G&G 247b / MATH 247b, Partial Differential Equations Stefan Steinerberger

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 260a / MATH 260a, Basic Analysis in Function Spaces Stefan Steinerberger
Diagonalization of linear operators, with applications in physics and engineering; calculus of variations; data analysis. MATH 260 is a natural continuation of PHYS 301. Prerequisites: MATH 120, and 222 or 225. QR

* **AMTH 342a / EENG 442a, 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 361a / STAT 361a, 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 STAT 242 and MATH 222 or 225, or equivalents. QR

AMTH 364b / EENG 454b / STAT 364b, Information Theory Staff
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 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 437b / ECON 413b / EENG 437b, 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** Daniel Spielman
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** Daniel Spielman

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 491a or b, Senior Project** Daniel Spielman

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: Victor E. Henrich, 327 BCT, 432-4399,
victor.henrich@yale.edu; appliedphysics.yale.edu

FACULTY OF THE DEPARTMENT OF APPLIED PHYSICS

Professors Charles Ahn, † Sean Barrett, Hui Cao, Richard Chang (*Emeritus*), Michel Devoret, Paul Fleury, † Steven Girvin, † Leonid Glazman, Victor Henrich, Sohrab Ismail-Beigi, † Marshall Long, † Tso-Ping Ma, Simon Mochrie, Daniel Prober, Nicholas Read, † Mark Reed, Robert Schoelkopf, † Ramamurti Shankar, † Mitchell Smooke, A. Douglas Stone, † John Tully, Robert Wheeler (*Emeritus*), Werner Wolf (*Emeritus*)

Associate Professors † Eric Dufresne, † Jack Harris, † Corey O'Hern, † Hongxing Tang

Assistant Professors Liang Jiang, Peter Rakich

† A joint appointment with primary affiliation in another department.

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.

Introductory courses and prerequisites During the freshman year, students interested in Applied Physics should start by taking courses in mathematics, and 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 Freshman Web site (<http://yalecollege.yale.edu/content/academic-information>) for more information.

The recommended sequence in mathematics for students interested in Applied Physics or Electrical or Mechanical Engineering is MATH 115, APHY 151, MATH 222, and APHY 194. Either MATH 120 or MATH 230, 231 is an acceptable alternative to APHY 151, and MATH 225 is an acceptable alternative to MATH 222. Similarly, PHYS 301 may be substituted for APHY 194 and MATH 222.

The recommended starting courses in physics are PHYS 200 and 201. These courses should be taken in the freshman 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 freshman year, or PHYS 200 and 201 during their sophomore year after they have taken more mathematics courses. Two laboratory courses, such as PHYS 205L and 206L, should be taken at some time during the freshman or sophomore year.

Because computers are ubiquitous in the practical applications of physics, students interested in Applied Physics should also take a course on the use of computers early in their studies. ENAS 130 is recommended; a comparable course in computer science may be substituted with the approval of the director of undergraduate studies.

The multiplicity of choices facing students interested in this general area indicates the importance of informed advice for freshmen. Students should consult freely with directors of undergraduate studies and individual faculty members in their departments of interest to optimize choices and to ensure maximum flexibility at the time a major is selected.

Requirements of the major The major in Applied Physics requires eight courses beyond the introductory sequence. Two of these must be APHY 471, 472. All majors are also required to take APHY 322, 439, and PHYS 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.

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 (p. 551), Engineering (p. 275), 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 director of undergraduate studies as early as possible to discuss available options and general requirements.

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:

Freshman	Sophomore	Junior	Senior
APHY 151	APHY 194	APHY 439	APHY 448
MATH 222	APHY 322	APHY 472	APHY 449
PHYS 200	ENAS 130	EENG 320	APHY 471
PHYS 201	PHYS 206L	PHYS 420	
PHYS 205L			

A student interested in alternative energy who starts physics in the sophomore year and conducts research in the senior year might elect:

Freshman	Sophomore	Junior	Senior
MATH 115	APHY 194	APHY 322	APHY 448
MATH 120	MATH 222	APHY 439	APHY 471
	PHYS 200	EENG 320	APHY 472
	PHYS 201	ENAS 130	EENG 406
	PHYS 205L	PHYS 420	
	PHYS 206L		

Approval of programs 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 director of undergraduate studies as early as possible, and in any case by the end of the sophomore year.

REQUIREMENTS OF THE MAJOR

Prerequisites PHYS 180, 181, or 200, 201, with appropriate math coreqs and 2 lab courses as specified; APHY 151 or MATH 120; MATH 222 and APHY 194, or PHYS 301; ENAS 130

Number of courses 8 term courses beyond prereqs (incl senior req)

Distribution of courses 3 courses in physical or mathematical sciences or engineering in area of concentration, with DUS approval

Specific courses required APHY 322, 439, PHYS 420, or equivalents

Substitution permitted Any relevant course approved by DUS

Senior requirement APHY 471 and 472

Courses

APHY 151a or b / ENAS 151a or b, Multivariable Calculus for Engineers Staff
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 or b / ENAS 194a or b, Ordinary and Partial Differential Equations with Applications Staff

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 321b / EENG 401b, 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 448a / PHYS 448a, Solid-State Physics I Victor Henrich

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 471a and APHY 472b, Special Projects** Victor Henrich

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. These courses may be taken at any appropriate time in the student's career; they may be taken more than once. Permission of the faculty adviser and of the director of undergraduate studies is required.

Archaeological Studies

Director of undergraduate studies: Oswaldo Chinchilla, Rm. 301, 51 Hillhouse Ave., 436-5923, oswaldo.chinchilla@yale.edu; www.yale.edu/archaeology

COUNCIL ON ARCHAEOLOGICAL STUDIES

Anthropology Richard Burger (*Chair*), Oswaldo Chinchilla, Thomas Fenn, Andrew Hill, William Honeychurch, Roderick McIntosh, Eric Sargis, Anne Underhill

Classics Milette Gaifman, Andrew Johnston, Diana Kleiner

Geology & Geophysics Ronald Smith

History Valerie Hansen

History of Art Edward Cooke, Jr., Mary Miller

Near Eastern Languages & Civilizations John Darnell, Karen Foster, Eckart Frahm, Colleen Manassa, Harvey Weiss

Religious Studies Stephen Davis

This special 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 Sachem Street, or to the director of undergraduate studies.

The major in Archaeological Studies provides a program of interdepartmental offerings covering prehistoric, early historic, and medieval 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 physical science. 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 thirteen courses, including the senior project. The following six courses are required: an introductory survey; a summer course in field techniques or a Yale-affiliated summer research project, approved in advance by the director of undergraduate studies; 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 six 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 of Art, and Near Eastern Languages and Civilizations. Some courses may be applied to categories other than the ones in which they are listed in this bulletin, upon application to the director of undergraduate studies. For three of the seven archaeology electives students may, with permission of the director of undergraduate studies, substitute three courses from other departments in areas related to their research.

Students majoring in Archaeological Studies are strongly encouraged, but not required, to devote a second summer either to archaeological research in the field or laboratory or to an additional field course in archaeology. Members of the Council faculty currently direct archaeological field projects in China, Egypt, Guatemala, Peru, Mali, Mongolia, Senegal, Syria, and Rome. Qualified majors are encouraged to apply for research positions with these projects.

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 director of undergraduate studies at the beginning of each term.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 13 term courses (incl senior project)

Specific course required ARCG 316L

Distribution of courses 1 intro survey; 1 summer field techniques course or research project, as specified; 1 advanced lab; 1 theory course; 7 electives, at least 1 in each of 3 areas, as specified

Substitution permitted For 3 electives, 3 courses related to research, with DUS permission

Senior requirement Research project (ARCG 491)

Anthropology

ARCG 171b / ANTH 171b, Great Civilizations of the Ancient World Thomas Fenn

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 172a / ANTH 172a, 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 255b / ANTH 255b / LAST 255b, Inca Culture and Society** Richard Burger

The history and organization of the Inca empire and its impact on the nations and cultures it conquered. The role of archaeology in understanding the transformation of Andean lifeways; the interplay between ethnohistoric and archaeological approaches to the subject. SO

ARCG 264a / ANTH 264a, 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 267b / ANTH 267b, Human Evolution Andrew Hill

Examination of the fossil record of human evolution, including both paleontological and archaeological evidence for changes in hominid behavior during the Pleistocene. Prerequisite: an introductory course in biological anthropology or biology. SO

ARCG 271a / ANTH 271a, Human Ecology Brian Wood

Introduction to ways in which people use and relate to their physical and social environments in both the past and the present. Adaptations underlying humanity's unique ecological niche; cultural diversity in subsistence and resource use; population growth and regulation; anthropogenic evolutionary and ecological change. SO

ARCG 294b / ANTH 294b, The Ancient Maya Oswaldo Chinchilla Mazariegos

Introduction to the archaeological study of ancient Maya civilization in southern Mexico and northern Central America. Maya origins and modes of adaptation to

a tropical forest environment; political history of the Classic Maya and competing theories about their collapse; overviews of Maya art, calendar, and writing. SO

ARCG 316Lb / ANTH 316Lb, Introduction to Archaeological Laboratory Sciences

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 320b / ANTH 320b / EVST 321b / NELC 320, From Babylon to Bush** Harvey Weiss

Analysis of Mesopotamian transformations from the earliest agriculture villages to the earliest cities, states, and civilization, to the earliest empires, as well as the region-wide collapses that punctuated these developments. Forces that drove these uniquely early Mesopotamian developments. Essential archaeological questions, including why each transformation happened, developed, and evolved. The end of the Ottoman empire and the British (1917) and American (1991, 2003) invasions. HU, SO

*** ARCG 385a / ANTH 385a, 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 397b / ANTH 397b, Archaeology of East Asia** Anne Underhill

Introduction to the findings and practice of archaeology in China, Japan, Korea, and southeast Asia. Methods used by archaeologists to interpret social organization, economic organization, and ritual life. Attention to major transformations such as the initial peopling of an area, establishment of farming villages, the development of cities, interregional interactions, and the nature of political authority. SO

*** ARCG 410b / ANTH 410b, Ethnohistory and Archaeology** Roderick McIntosh

Review of the major problems and methodologies associated with the use of ethnohistory by archaeologists. The construction of a historical imagination. Sources include colonial and “visitor” documents, peoples’ written descriptions of themselves, oral traditions, classic ethnographies, and writings in art history. SO

*** ARCG 429a / ANTH 429a, Integrating Remote Sensing in Archaeology** William Honeychurch and Andrew Womack

Introduction to satellite and geophysical remote sensing in anthropology. Focus on integrating this data with other techniques and databases for manipulation and application to archaeological research. Some experience with geographical information systems (GIS) helpful but not required. SO

*** ARCG 447b / ANTH 447b, Hunter-Gatherers** Brian Wood

Survey of the ecology, economics, and political and social organization of contemporary hunter-gatherers, and review of anthropological inquiry into foraging societies. Approaches to understanding hunter-gatherer variability and their influence on the study of human evolution and prehistory. SO

* **ARCG 450b / ANTH 450b, Analysis of Lithic Technology** Oswaldo Chinchilla
Mazariegos

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 456a / ANTH 456a, Reconstructing Human Evolution: An Ecological Approach** Andrew Hill

Methods for obtaining data relevant to ecological factors that have affected human evolutionary change, such as changes in climate, competition with other animals, and availability and kinds of food supply. Evaluation of techniques for obtaining ecological data in such fields as geology, paleobotany, and paleozoology. Ethnographic, primatological, and other biological models of early human behavior. SO

Classics

ARCG 161b / CLCV 161b / HSAR 247b, Art and Myth in Greek Antiquity Milette
Gaifman

Visual exploration of Greek mythology through the study of ancient Greek art and architecture. Greek gods, heroes, and mythological scenes foundational to Western culture; the complex nature of Greek mythology; how art and architecture rendered myths ever present in ancient Greek daily experience; ways in which visual representations can articulate stories. Use of collections in the Yale University Art Gallery. HU

ARCG 252a / CLCV 175a / HSAR 252a, 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

Environmental Studies

* **ARCG 473b / ANTH 473b / EVST 473b, Abrupt Climate Change and Societal Collapse** Harvey Weiss

The coincidence of societal collapses throughout history with decadal and century-scale drought events. Challenges to anthropological and historical paradigms of cultural adaptation and resilience. Examination of archaeological and historical records and high-resolution sets of paleoclimate proxies. HU, 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 238a / HSAR 238a / NELC 107a, Buried Cities: Thera, Pompeii, and Herculaneum Karen Foster

Study of three ancient cities buried by volcanic eruptions—Thera in c. 1530 B.C. and Pompeii and Herculaneum in A.D. 79—with emphasis on their architecture, wall paintings, and small finds in cultural and historical context. HU

Near Eastern Languages and Civilizations

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

Examination of approximately 10,000 years of Nile Valley cultural history, with an introduction to the historical and archaeological study of Egypt and Nubia. Consideration of the Nile Valley as the meeting place of the cultures and societies of northeast Africa. Various written and visual sources are used, including the collections of the Peabody Museum and the Yale Art Gallery. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.

WR, HU

* **ARCG 020b / CLCV 059b / EVST 030b / HIST 020b / NELC 026b, Rivers and Civilization** Joseph Manning and 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. Includes a week-long field trip to Turkey. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU, SO

ARCG 244b / NELC 109b / RLST 245b, 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 Courses

* **ARCG 471a and ARCG 472b, 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, 328 RDH, 432-8325,
bimal.mendis@yale.edu

MEMBERS OF THE SCHOOL OF ARCHITECTURE TEACHING IN YALE COLLEGE

Professors D. Michelle Addington, Turner Brooks (*Adjunct*), Keller Easterling, Alexander Garvin (*Adjunct*), Steven Harris (*Adjunct*), Dolores Hayden, Alan Plattus, Alexander Purves (*Emeritus*)

Associate Professor Eeva-Liisa Pelkonen

Assistant Professors Sunil Bald (*Adjunct*), Bimal Mendis (*Adjunct*), Kyoung Sun Moon, W. Todd Reisz (*Visiting*), Elihu Rubin

Lecturers Victor Agran, Karla Britton, Ariane Lourie Harrison, Daniel Sherer

Critics Marta Justo Caldeira, Andrei Harwell, Adam Hopfner, Joyce Hsiang, Timothy Newton

Application to the Architecture major Yale College students must apply to enter the major during the spring term of their sophomore year, after taking ARCH 150, 154, and 249. An application to the major must be submitted to the office of the director of undergraduate studies no later than 4 p.m. on March 30, 2016, in 328 Rudolph (third floor). All applications are reviewed by a faculty committee. Applications must include the following information: name, address, telephone number, courses related to architecture already taken, a statement of purpose, and a writing sample from Yale College. Portfolios representative of course work for ARCH 150, 154, and 249 must also be submitted for review as part of the application process by May 2, 2016. Applicants must stipulate their first, second, and third choices for the three concentrations in the major. The concentrations, described below, are Design; History, Theory, and Criticism; and Urban Studies. Although qualified students and students who have fulfilled the prerequisites may be admitted into the Architecture major, they will not necessarily be admitted to their first-choice concentration. Applicants will be notified in writing regarding acceptance to the major by May 31, 2016. The major is usually limited to twenty students in the junior year and twenty students in the senior year, with a maximum of sixteen students in the design concentration for each year. Students have an opportunity to petition the director of undergraduate studies at the end of either the fall or spring term of their junior year if they wish to change concentrations. The director of undergraduate studies will notify students of the result of such a petition. Based on a student's performance in required courses, the director of undergraduate studies may also recommend a change in concentration.

Introduction to architecture Introductory courses are ARCH 150, 154, and 249. They are open to all Yale College students except freshmen, and are required for those interested in the Architecture major prior to application. Freshmen may consider courses such as a freshman seminar, ARCH 260, 261, or STCY 176.

The standard major 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 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 (<http://www.naab.org>) (NAAB).

The Design concentration 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 program.

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 director of undergraduate studies 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.

The 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.

Requirements of the major Students majoring in Architecture are required to take fifteen course credits. Majors are expected to take three prerequisites in 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 Urban Studies.

The courses for all concentrations include three prerequisites: ARCH 150, 154, and 249. The core of four courses required for all concentrations includes the studio courses ARCH 250 and 251, to be taken during the junior year after the student is accepted into the major, and the history of architecture surveys ARCH 260 and 261, to be completed by the end of the junior year. The electives are categorized under four broad subject areas: history and theory of architecture, urbanism and landscape, materials and technology, and structures and computation.

For the Design concentration, the following additional courses are required:

1. One elective in history and theory of architecture chosen from ARCH 341, 348, 431, or other relevant course in History of Art (p. 418) approved by the director of undergraduate studies
2. One elective in urbanism and landscape chosen from ARCH 340, 344, 345, 347, 348, 351, STCY 176, or other relevant course in American Studies (p. 107), Ethics,

Politics, and Economics (p. 311), Environmental Studies (p. 303), or Political Science (p. 561) approved by the director of undergraduate studies

3. One elective in materials and technology chosen from ARCH 162, 163, or other relevant course in Environmental Studies (p. 303) approved by the director of undergraduate studies
4. One elective in structures and computation chosen from ARCH 161, an approved calculus or physics course, or other relevant course approved by the director of undergraduate studies. Elementary calculus is strongly recommended as preparation for graduate studies in Architecture
5. The senior requirement: ARCH 450 and 494

For the History, Theory, and Criticism concentration, the following additional courses are required:

1. Four electives in history and theory of architecture, chosen from ARCH 341, 348, 431, or other relevant courses in History of Art (p. 418) approved by the director of undergraduate studies
2. One elective in urbanism and landscape chosen from ARCH 340, 344, 345, 347, 348, 351, STCY 176, or other relevant course in American Studies (p. 107), Ethics, Politics, and Economics (p. 311), Environmental Studies (p. 303), or Political Science (p. 561) approved by the director of undergraduate studies
3. The senior requirement: ARCH 490 and 491

For the Urban Studies concentration, the following additional courses are required:

1. Four electives in urbanism and landscape chosen from ARCH 340, 344, 345, 347, 348, 351, STCY 176, or other relevant courses approved by the director of undergraduate studies in American Studies (p. 107), Ethics, Politics, and Economics (p. 311), Environmental Studies (p. 303), or Political Science (p. 561)
2. One elective in history and theory of architecture chosen from ARCH 341, 348, 431, or other relevant course in History of Art (p. 418) approved by the director of undergraduate studies
3. 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 249 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 director of undergraduate studies or the director of digital media, John Eberhart (432-9655, john.eberhart@yale.edu).

Library orientation The Architecture program requires all students to complete a ninety-minute introductory library research session. Students enrolled in ARCH 249 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

(436-8052, lindsay.king@yale.edu). Questions should be addressed to the director of undergraduate studies.

Shop orientation The Architecture program requires all majors to complete several woodshop and materials lab orientation sessions. Students enrolled in ARCH 249 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 director of undergraduate studies or to the shop coordinator, Timothy Newton (432-7234, timothy.newton@yale.edu).

Senior requirement Seniors in the Design track take ARCH 450, the senior studio, and 494, the senior design project. Seniors in the History, Theory, and Criticism track and in the Urban Studies track take ARCH 490, the senior research colloquium, and 491, the senior project. Proposals for senior projects and essays are submitted in the fall term for review and approval by the senior project coordinator, and then distributed to faculty members for review before the faculty members agree to become senior advisers. Senior essays and projects for ARCH 491 are due in the office of the director of undergraduate studies by Friday, April 15, 2016. In the spring term, all seniors must submit a portfolio of their work to the office of the director of undergraduate studies by Friday, May 6, 2016. For all majors, this portfolio must be representative of the student's design work including prerequisites and the senior project. History, Theory, and Criticism majors and Urban Studies majors must also include a copy of the senior essay and other appropriate texts.

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 open to 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, 154, 249

Number of courses 15 course credits (incl prereqs and senior req)

Specific courses required ARCH 250, 251, 260, 261

Distribution of courses *Design*—1 elective in history and theory of architecture, 1 in urbanism and landscape, 1 in materials and technology, 1 in structures and computation, all approved by DUS; *History, Theory, and Criticism*—4 electives in history and theory of architecture, 1 in urbanism and landscape, all approved by DUS; *Urban Studies*—4 electives in urbanism and landscape, 1 in history and theory of architecture, all approved by DUS

Other Orientation sessions in digital media, library, and woodshop and materials lab

Senior requirement *All concentrations*—portfolio representative of design work, including prereqs and senior req; *Design*—ARCH 450 and 494; *History, Theory, and Criticism*—ARCH 490 and 491; *Urban Studies*—ARCH 490 and 491

Courses

*** ARCH 005a, Modern Architecture and the City** Karla Britton

Issues in modern American architecture and urbanism examined through the work of prominent architects closely associated with Yale and New Haven. Perspectives on the character, development, and sociocultural consequences of building today. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.

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. Not open to freshmen. Required for all Architecture majors.

*** 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 163b, Environment, Energy, Building Michelle Addington

An introduction to energy and environmental issues faced by the discipline of architecture. Global environmental issues, basic principles of energy generation and energy use, and fundamental climatic precursors and patterns. The complexity of developing solutions that address a wide range of local and global concerns.

*** 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 249b, The Analytic Model** Staff

Introduction to the history and practice of architectural analysis. Students produce drawings, models, and diagrams of significant architectural works in order to facilitate a comprehensive understanding of specific architects, buildings, and contexts. Description of a variety of approaches and the reciprocal relationship between analysis and design. Required for all Architecture majors.

*** ARCH 250a, Methods and Form in Architecture I** Bimal Mendis

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** Joyce Hsiang

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, History of Architecture I: Antiquity to the Baroque Daniel Sherer

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 261b / HSAR 325b, History of Architecture II: The Eighteenth Century to the Millennium** Eeva-Liisa Pelkonen

Modern architecture and urbanism from the eighteenth century to the end of the twentieth. Genesis and meaning of architectural form, applying national, cultural, and international contexts. HU

* **ARCH 344a, Urban Life and Landscape** Elihu Rubin

The built environment as a text tool for constructing narratives of human activity, aspiration, and struggle. Methods of viewing the ordinary landscape of the twentieth-century American city: pulling apart its historical layers, examining social meanings, and observing its function today. Modes of inquiry include video, public presentations, field trips, photography, and writing. HU

ARCH 345b, Civic Art: Introduction to Urban Design Staff

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 347b / EP&E 426b / PLSC 250b, Infrastructure: Politics and Design** Elihu Rubin

Infrastructures—the physical frameworks for human settlement, urbanization, and social life, including networks for transportation, water, energy, and communication. Current debates on infrastructure spending in the context of historical investments in the modern American city. SO

* **ARCH 348b, The Benevolent City** William Reisz

Cities as places of violence, vice, and irrelevance vs. cities as stages where humanity reaches its most elevated heights of self-realization and cultural production. Critical review of writing about cities to identify recurring arguments and value systems. The question of whether cities should be expected to convey benevolence on their inhabitants. WR, HU

* **ARCH 351a / AMST 381a, Poets' Landscapes** Dolores Hayden

Introduction to techniques poets have used to ground their work in the landscapes and buildings of American towns and cities including Chicago, New York, and Los Angeles. Attention to poems from a national automotive landscape as well as narrative poems about cities. Writing exercises in different poetic forms; readings from the works of

Dickinson, Frost, Bishop, Lowell, Wilbur, Dickey, Pinsky, Cervantes, and Merrill. WR, HU

ARCH 385a, New Haven and the American City Alan Plattus and Elihu Rubin
New Haven as a window on the problems and promise of American urbanism. New Haven compared with New York, New Orleans, Louisville, Cleveland, Houston, Denver, and San Francisco. Emphasis on the historical development of transportation, manufacturing, housing, governance, and culture. Problems of planning, education, class, and race. SO

ARCH 431b, Religion and Modern Architecture Karla Britton
The historical evolution of sacred building in the twentieth and twenty-first centuries. Relations between a building, its cultural environment, and its cult. The influence of religion in contemporary civic life as manifest in the design and construction of prominent religious buildings. Examination of mosques, synagogues, temples, and churches. Perspectives from philosophy, comparative religion, liturgical studies, and architectural theory and practice. WR, HU

* **ARCH 450a, Senior Studio** Turner Brooks and Adam Hopfner
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.

* **ARCH 472La, Individual Tutorial Laboratory** Bimal Mendis
An independent tutorial focusing on methods and techniques of representation in architecture, including the synthesis of studio work using a variety of visual media. Concurrently with ARCH 471 or after a spring term abroad. RP ½ Course cr

* **ARCH 490a, Senior Research Colloquium** Karla Britton
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, Senior Project** Staff
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 404b, 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, Photography, Printmaking, and Sculpture)

Director of undergraduate studies: Lisa Kereszi, 122 GRN, 432-2600, art.dus@yale.edu; art.yale.edu

MEMBERS OF THE SCHOOL OF ART TEACHING IN YALE COLLEGE

Professors Samuel Messer (*Adjunct*), Michael Roemer (*Adjunct*), Robert Storr

Associate Professors Gregory Crewdson, Anoka Faruquee, Martin Kersels

Assistant Professor Michael Queenland

Senior Critics Alice Chung, John Gambell, Pamela Hovland, Christopher Pullman, Douglass Scott, Henk van Assen

Critics Julian Bittiner, Johannes DeYoung, Lisa Kereszi, Sandra Luckow, Sarah Oppenheimer

Lecturers Jonathan Andrews, Mark Aronson, Anna Betbeze, Sandra Burns, Susan Cahan, Yeju Choi, Benjamin Donaldson, Dru Donovan, Munro Galloway, Julian Gilbert-Davis, Kate Greene, Curran Hatleberg, Elana Herzog, Brent Howard, Joy Kim, Sarah Lasley, Michelle Lopez, Meredith Miller, Dushan Petrovich, Richard Rose, Carolyn Salas, Laurel Schwulst, Scott Stowell, Ka-Man Tse, William Villalongo, Anahita Vossoughi, Natalie Westbrook

Students in the Art major develop an 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 fields of art history and theory, and gain a high level of mastery of at least one artistic discipline. Students may concentrate on a medium such as painting/printmaking, sculpture, graphic design, photography, or film.

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 will be given to School of Art students and declared Art majors. The director of undergraduate studies and members of the Art faculty will be present for counseling on Tuesday, September 1, 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 Street. 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, when each instructor will determine the class enrollment. Classes begin on Wednesday, September 2. For courses beginning in the spring term, counseling will be held on Tuesday, January 19, 2016, from 12 noon to 1:30

p.m. adjacent to the School of Art Gallery; Art classes begin on Wednesday, January 20, 2016. All Art majors are required to register with the director of undergraduate studies 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 director of undergraduate studies.

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 yearlong Senior Project (ART 495 and 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.

Area 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, Introduction to Graphic Design; ART 264 and 265, Typography in Graphic Design I and II; ART 368, Intermediate Graphic Design, or ART 369, Interactive Design; and ART 468 and 469, Advanced Graphic Design I and II. The *painting/printmaking concentration* requires ART 116, Color; ART 130, Painting Basics, or ART 230 or 231, Introductory Painting; ART 330 and 331, Intermediate Painting I and II; ART 224, Figure Drawing, or ART 356, Printmaking I; and ART 430, Painting Studio. Students in the *photography concentration* take ART 136, Introductory Black-and-White Photography, or ART 138, Digital Photography; ART 237, Intermediate Photography; ART 338, Intermediate Digital Photography; ART 379, Photographic Techniques; and ART 401, Advanced Photography. The *sculpture concentration* requires ART 110, Sculpture Basics; ART 345 and 346, Intermediate Sculpture I and II; ART 371, Sound Art, or ART 348, Sculpture with Time-Based Mediums; and ART 445, Advanced Sculpture I. Required courses for the *filmmaking concentration* include ART 141 and 142, Language of Film Workshop I and II; ART 341, Intermediate Fiction Film Workshop; ART 342, Intermediate Documentary Film Workshop; and ART 442 and 443, Advanced Film Workshop I and II. Students in the filmmaking concentration may substitute courses in film and media studies for the history of art requirement.

Summer fellowship Art majors are eligible for the Ellen Battell Stoeckel Fellowship for study at the Yale University Summer School of Music and Art at 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 director of undergraduate studies. Course credits in studio art earned at other institutions may be applied toward the requirements of the major, at the discretion of the director of undergraduate studies 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 materials fees are levied in individual courses, as specified at the end of the course description. 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 ART 301; *Graphic design*—ART 132, 264, 265; ART 368 or 369; ART 468, 469; *Painting/printmaking*—ART 116; ART 130, 230, or 231; ART 330, 331; ART 224 or 356; ART 430; *Photography*—ART 136 or 138; ART 237, 338, 379, 401; *Sculpture*—ART 110, 345, 346; ART 371 or 348; ART 445; *Filmmaking*—ART 141, 142, 341, 342, 442, 443

Distribution of courses 5 courses at 100 level (incl prereqs); 4 courses at 200 level or above; 2 courses in hist of art

Senior requirement Senior project (ART 495 and 496)

Substitution permitted *Filmmaking concentration*—2 courses in film & media studies for hist of art req

Unless otherwise indicated, spring-term classes in Art begin on Wednesday, January 20, 2016.

Introductory Courses

[ART 001, Studies in Visual Biography]

* **ART 002b, Paper** Elana Herzog

Paper as a material for making art. How paper is made; myriad ways that it is used in the collections of Yale's galleries and libraries. Creation of paper objects to explore the formal properties of sculpture, including volume, mass, line, and structure. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.

RP

* **ART 003a, Blue** Jessica Helfand

The cultural and iconic history of the color blue and its role as both a method and a motive for making work in the studio. The word "blue" and its etymological core, evocative connotations, colloquial nuance, and semantic role in different languages and cultures; scientific and sociological issues; blue in film and the fine arts. Projects experiment with writing, collecting, collage, and digital video. Use of materials from the Beinecke Library. Enrollment limited to 15 freshmen. Preregistration required; see under Freshman Seminar Program. HU

*** ART 004a, Words and Pictures** Dushan Petrovich

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 freshmen. Preregistration required; see under Freshman 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 freshmen. Preregistration required; see under Freshman Seminar Program. HU

*** ART 110a or b, Sculpture Basics** Staff

Introduction to the concepts of space, form, weight, mass, and design in sculpture. Basic types and techniques of construction and material; concepts and approaches to the understanding and development of sculptural ideas. Shops and studio are available during days and evenings throughout the week. Materials fee: \$75. 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 116b, Color Practice** Anna Betbeze

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 Julian Gilbert-Davis

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 122a, Introduction to Sculpture: Video** Sandra Burns

Ways in which digital tools can inform the production of three-dimensional objects. Digital photography, including RAW photography, video, editing, basic lighting, color correction, and inkjet printing. Introduction to basic woodworking and welding. Digital processes as they intersect with a variety of materials and subjects. Materials fee: \$150. Enrollment limited to 12. HU RP

*** ART 125a, Introduction to Sculpture: Mold Making** Carolyn Salas

Instruction in the practical aspects of mold making and casting in a variety of materials and techniques. Discussion of contemporary issues in art and culture, including the use of traditional principles in sculpture in an age of mass production. Methods include waste molds, piece molds, life casts, and flexible molds. Materials fee: \$75. HU RP

*** ART 130a, Painting Basics** Dushan Petrovich

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–Art majors and for Art majors outside the painting concentration. Students who intend to pursue the painting concentration or take multiple courses in painting should take ART 230 and/or 231.

HU RP

*** ART 132a or b, Introductory 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, Introductory Black-and-White Photography** 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** Staff

An introductory exploration of the transition of photographic processes and techniques into digital formats. Students produce original work using a digital camera. Introduction to a range of tools including color correction, layers, making selections, and inkjet printing. Assignments include weekly critiques and a final project. Materials fee: \$150. HU RP

*** ART 141a / FILM 161a, Introductory Film Writing and Directing** Michael Roemer

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. Materials fee: \$150. Priority to majors in Art and in Film & Media Studies. Prerequisite for majors in Film & Media Studies: FILM 150.

RP

*** ART 142a or b / FILM 162a or b, 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 145a or b, Introduction to Digital Video** Sarah Lasley

Introduction to the basic tools of digital video production. DV camera operation, sound, and Mac-based editing with Final Cut Pro software. Individual and collaborative assignments explore the visual language and production challenges of DV. Emphasis on the spatial and visual aspects of the medium rather than the narrative. Screenings of experimental film, video art, and DV feature films. Materials fee: \$150. Enrollment limited to 12. RP

ART 185a, Principles of Animation Johannes DeYoung

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 202, Feminist Theory and Feminist Art**]

[**ART 210, Sculpture as Object**]

*** ART 223a and ART 224b, Figure Drawing** William Villalongo

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. RP

ART 230a and ART 231b, Introductory Painting Staff

A rigorous introduction to form and content in painting, starting with structured observational study and ending with student-directed projects. Emphasis on the syntax of composition, color, and space in a wide range of historical and contemporary painting, both representational and abstract. Materials fee: \$75 per term. Prerequisite: ART 114 or 130 or equivalent. RP

*** ART 235a / THST 235a, Dance Theater** Emily Coates

A practical and theoretical survey of dance theater history. Introduction to movement vocabularies, physical techniques, and repertoire from post-1950 modern and postmodern dance theater. Open to students of all levels and majors. HU

* **ART 237a, Intermediate Photography** Lisa Kereszi

A class in black-and-white photography extending the concerns of ART 136.

Introduction to the use of medium-format cameras. Specialized topics include night photography, the use of flash, developing roll film, basic digital scanning, and grayscale printing techniques. Survey of the rich tradition of handheld photography and the production of artists such as Lartigue, Brassai, Diane Arbus, Lee Friedlander, and Robert Adams. Materials fee: \$150. Prerequisite: ART 136 or equivalent. HU RP

* **ART 264a, Typography in Graphic Design I** 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 in Graphic Design II** 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 285b, Digital Animation** Johannes DeYoung

Introduction to the principles, history, and practice of animation in visual art and film. Historical and theoretical developments in twentieth- and twenty-first-century animation used as a framework for making digital animation. Production focuses on digital stop-motion and compositing, as well as 2-D and 3-D computer-generated animation. Workshops in relevant software. Materials fee: \$150. Prerequisites: ART 111, 114, or 145, and familiarity with Macintosh-based platforms. RP

* **ART 301b, Critical Theory in the Studio** Jeehye Kim

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 324b, Painting Materials and Methods** Mark Aronson

An introduction to historical materials and methods of painting. Students examine masterworks in the Yale Art Gallery and the Center for British Art, and explore observed techniques in their own painting. Techniques include quick-drying indirect tempera, slow-drying and layered oil painting, and the modernist direct application of paint; supports include wood, canvas, paper, and metal. Materials fee \$75. Prerequisite: ART 114 or 130 or permission of instructor. RP

* **ART 331b, Intermediate Painting** William Villalongo

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 230 or 231. RP

ART 332a, Painting Time Samuel Messer

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 338a, Intermediate Digital Photography Curran Hatleberg

Exploration of both the technical and conceptual aspects of digital photography. Range of tools includes advanced film scanning, working with RAW files, masks, compositing and grayscale, and color inkjet printing. Students produce original work, with special attention to ways in which their technical decisions can clarify their artistic intentions.

Materials fee: \$150. Prerequisite: ART 138. RP

ART 341a or b / FILM 355a or b, Intermediate Film Writing and Directing Staff

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 141 or 142, and FILM 150. RP

ART 342b / FILM 356b, 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 345a, Material Form and Fabrication Brent Howard

Further investigation into the history of sculpture and questions pertinent to contemporary art. Exploration of new techniques and materials along with refinement of familiar skills. Focus on helping students become self-directed in their work.

Individual and group discussion and visits to museums and galleries. Materials fee: \$75 per term. Enrollment limited to 12. Prerequisite: ART 120, 121, or 122, or equivalent; or with permission of instructor. RP

ART 346b, Dematerial/Material Julian Gilbert-Davis

Further investigation into the history of sculpture and questions pertinent to contemporary art. Exploration of new techniques and materials along with refinement of familiar skills. Focus on helping students become self-directed in their work.

Individual and group discussion and visits to museums and galleries. Materials fee: \$75 per term. Enrollment limited to 12. Prerequisite: ART 120, 121, 122, or equivalent; or with permission of instructor. RP

[ART 348, Body, Space, and Time]**[ART 355, Silkscreen Printing]****ART 356a, Printmaking I** Staff

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, Intermediate Graphic Design I** 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** Laurel Schwulst

Interactive design explored through the development of projects that are based on line. Concepts of prompt, feedback, and variable conditions; Web-specific design issues such as navigation and pacing, as well as design for variable sizes and devices; best practices in code craft and design. The Web as a social ecosystem in which time and performance play important roles. Instruction in HTML, CSS, and some Javascript. 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. Prerequisite: ART 265; ART 368 recommended. RP

ART 371b / MUSI 370b, Sound Art Brian Kane

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, Photographic Techniques** Benjamin Donaldson

An opportunity for experienced photography students to become involved with the technical aspects of the medium. Concentrated study of view camera operations; techniques in added lighting and advanced printing; scanning and printing of negatives; discussion of historic photographic traditions. Student work is discussed in regular critiques. Previous digital training may be employed, but focus is primarily analog. Materials fee: \$150. Prerequisite: ART 237 or permission of instructor. RP

*** 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. RP

Advanced Courses

* ART 401b, **Advanced Photography** Lisa Kereszi

An exploration of the practice of photography, either analog or digital. Student work is discussed in regular critiques, and lectures are framed around the aesthetic concerns that the work provokes. Materials fee: \$150. Prerequisites: ART 379 and, for those working digitally, ART 138. Required for Art majors concentrating in photography. RP

[ART 430, **Advanced Painting Studio**]

* 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 446b, **Advanced Sculpture** Martin Kersels

Self-directed work in sculpture. Group discussion of student projects, with readings, slides, and videos that address current art practices. Regular individual and group critiques. Materials fee: \$75 per term. Enrollment limited to 12. Prerequisite: ART 345 or 346 or equivalent, or permission of instructor. RP

* ART 457b, **Printmaking II** Staff

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. Prerequisite: at least one term of printmaking. RP

ART 468a and ART 469b, **Advanced Graphic Design** 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 471a and ART 472b, **Independent Projects** Staff

Independent work that would not ordinarily be accomplished within existing courses, designed by the student in conjunction with a School of Art faculty member. A course proposal must be submitted on the appropriate form for approval by the director

of undergraduate studies and the faculty adviser. Expectations of the course include regular meetings, end-of-term critiques, and a graded evaluation. RP

*** ART 495a or b, Senior Project** Staff

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

Astronomy

Director of undergraduate studies: Priyamvada Natarajan, 272 JWG, 432-4833, astro.dus@yale.edu; www.astro.yale.edu

FACULTY OF THE DEPARTMENT OF ASTRONOMY

Professors Charles Bailyn, † Charles Baltay, Sarbani Basu, Paolo Coppi, Pierre Demarque (*Emeritus*), Debra Fischer, Marla Geha, Jeffrey Kenney, Richard Larson (*Emeritus*), Priyamvada Natarajan, † C. Megan Urry, William van Altena (*Emeritus*), Pieter van Dokkum (*Chair*), Robert Zinn

Associate Professors Hector Arce, † Daisuke Nagai, † Nikhil Padmanabhan, Frank van den Bosch

Lecturers Louise Edwards, Michael Faison

† A joint appointment with primary affiliation in another department.

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. degree in Astronomy and a B.S. degree in Astrophysics.

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 between 150 and 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 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.

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.

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 for the Class of 2016 Students in the Class of 2016 may fulfill the requirements of the major in Astronomy that were in place when they entered the major, as described in previous editions of this bulletin (<http://www.yale.edu/printer/bulletin/archivedpdfs/YCPS>). Alternatively, they may fulfill the requirements of the major as described below for the Class of 2017 and subsequent classes.

Requirements of the B.A. degree program for the Class of 2017 and subsequent classes 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.

The prerequisites for the B.A. program are PHYS 170 and 171, or 180 and 181, or 200 and 201, and MATH 112 and 115. 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. 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.

Before entering the junior year, students should consult the director of undergraduate studies.

Requirements of the B.S. degree program for the Class of 2017 and subsequent classes 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.

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.

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. 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.

Before entering the junior year, students must obtain approval of a course of study from the director of undergraduate 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; ASTR 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)

Courses

*** ASTR 030a, Search for Extraterrestrial Life** Michael Faison

Introduction to the search for extraterrestrial life. Review of current knowledge on the origins and evolution of life on Earth; applications to the search for life elsewhere in the universe. Discussion of what makes a planet habitable, how common these worlds are in the universe, and how we might search for them. Survey of past, current, and future searches for extraterrestrial intelligence. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, SC

*** ASTR 040b, Expanding Ideas of Time and Space** Louise Edwards

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 freshmen. Preregistration required; see under Freshman Seminar Program. SC

[**ASTR 110, Planets and Stars**]

ASTR 120b, Galaxies and the Universe Robert Zinn

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 130a, 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 135b, Archaeoastronomy Michael Faison

An introduction to how celestial patterns and events were observed and interpreted up to the Copernican revolution. Ancient observatories, calendar systems, records of astronomical events, and the role of astronomical knowledge in culture. Exercises in naked-eye observation of the sky. No prerequisites. SC

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. QR, SC ½ Course cr

ASTR 160b, Frontiers and Controversies in Astrophysics Louise Edwards

A detailed study of three fundamental areas in astrophysics that are currently subjects of intense research and debate: planetary systems around stars other than the sun; pulsars, black holes, and the relativistic effects associated with them; and the age and ultimate fate of the universe. No prerequisite other than a working knowledge of elementary algebra. QR, SC

ASTR 170a, Introduction to Cosmology Louise Edwards

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 210b, 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 220a, Galaxies and Cosmology Louise Edwards

An intensive introduction to extragalactic astronomy. The structure and contents of galaxies, evolution of galaxies, observational cosmology, and the history of the universe. Students observe a deep-sky object with campus telescopes. Prerequisite: a strong background in high school calculus and physics. May not be taken after ASTR 210. QR, SC

*** ASTR 255a / PHYS 295a, Research Methods in Astrophysics** Hector Arce

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. Includes an optional field trip during October recess to the Arecibo 300-meter radio telescope. A background in high school calculus and physics. No previous programming experience required. QR, SC RP

ASTR 310b, Galactic and Extragalactic Astronomy Jeffrey Kenney

Stellar populations and the structure of the Milky Way galaxy; the structure and evolution of external galaxies; the distribution of galaxies in the universe; galaxy interactions and active galactic nuclei. Prerequisites: MATH 115, PHYS 201, and ASTR 210 or 220, or equivalents, or with permission of instructor. QR, SC

ASTR 320a, 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 Priyamvada Natarajan

In-depth discussion of the physics underlying several recent discoveries in astrophysics and cosmology, including extrasolar planets, black holes, and the accelerating universe. Prerequisite: PHYS 170, 171, or 180, 181, or 200, 201, or 260, 261, or permission of instructor. QR, SC

[ASTR 355, Observational Astronomy]*** ASTR 356b / 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.

[ASTR 360, Interstellar Matter and Star Formation]*** ASTR 375b, Exoplanets** Debra Fischer

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 380a, 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 385, Introduction to Radio Astronomy]**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 420, Computational Methods for Astrophysics]**ASTR 430a, 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 465b, The Evolving Universe** Pieter Van Dokkum

Overview of cosmic history from the formation of the first star to the present day, focusing on direct observations of the high-redshift universe. Prerequisites: MATH 120, PHYS 201, and one astronomy course numbered above 200. Taught in alternate years. QR, SC RP

*** ASTR 471a and ASTR 472b, Independent Project in Astronomy** Priyamvada Natarajan

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** Priyamvada Natarajan
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** Priyamvada Natarajan
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

Yale offers three different biological sciences majors: Ecology and Evolutionary Biology (EEB), Molecular Biophysics and Biochemistry (MB&B), and Molecular, Cellular, and Developmental Biology (MCDB). The distinctions between these majors reflect the types of biological systems analysis each represents: the analysis of whole organisms, populations, and ecosystems (EEB); use of the tools of chemistry and physics to study life at the molecular level (MB&B); and molecular, cellular, and developmental biology, genetics, and neurobiology (MCDB). These approaches cover the vast breadth of disciplines in the biological sciences.

The courses BIOL 101–104 are designed as entry points to all three programs in the biological sciences. The prerequisites for the three majors are similar, so students need not commit to a specific major in the freshman year.

For information on the major requirements, course offerings, and departmental faculty of the biological sciences programs, see under Ecology and Evolutionary Biology (p. 241), Molecular Biophysics and Biochemistry (p. 501), and Molecular, Cellular, and Developmental Biology (p. 507).

Courses

BIOL 101a or b, Biochemistry and Biophysics Staff

Introduction to 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 introductory biology sequence; meets for the first half of the term. SC ½ Course cr

BIOL 102a or b, Principles of Cell Biology and Membrane Physiology Staff

Introduction to 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 introductory biology sequence; meets for the second half of the term. SC ½ Course cr

* **BIOL 103a or b, Genes and Development** Staff

Introduction to genes, 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 introductory biology sequence; meets for the first half of the term. SC ½ Course cr

BIOL 104a or b, Principles of Ecology and Evolutionary Biology Staff

Introduction to 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 introductory biology sequence; meets for the second half of the term. SC ½ Course cr

Biomedical Engineering

Director of undergraduate studies: James Duncan, N309 D TAC, 785-2427, 313 MEC, 432-9917, james.duncan@yale.edu; seas.yale.edu/departments/biomedical-engineering

FACULTY OF THE DEPARTMENT OF BIOMEDICAL ENGINEERING

Professors Richard Carson, † Nicholas Christakis, James Duncan, Jay Humphrey, Fahmeed Hyder, Andre Levchenko, † Laura Niklason, Douglas Rothman, Mark Saltzman, † Martin Schwartz, † Frederick Sigworth, † Brian Smith, † Hemant Tagare, † Paul Van Tassel, Steven Zucker

Associate Professors † Robin de Graaf, Tarek Fahmy, Themis Kyriakides, † Evan Morris, † Xenophon Papademetris, Lawrence Staib, † Corey Wilson

Assistant Professors † Joerg Bewersdorf, Stuart Campbell, † Michael Choma, Rong Fan, Anjelica Gonzalez, † Chi Liu, Kathryn Miller-Jensen, Michael Murrell, † Steven Tommasini, † Jiangbing Zhou

Lecturers † Liqiong Gui, † Jing Zhou

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

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 major 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 three biomedical engineering fields.

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 permission of the director of undergraduate studies); a lecture course in chemistry numbered CHEM 161 or higher (or CHEM 112 or higher); ENAS 194; MATH 115; MATH 120 or ENAS 151; PHYS 180, 181, 205L, and 206L (or 165L and 166L, with permission of the director of undergraduate studies).

Requirements of the major The B.S. degree program in Biomedical Engineering offers three tracks: bioimaging, biomechanics, and molecular engineering.

During the freshman year, students study basic mathematics, chemistry, and biology. By the end of the sophomore year, they have taken physics, ENAS 194, Ordinary and Partial Differential Equations with Applications, BENG 249, Introduction to Biomedical Computation, and BENG 350, Physiological Systems. In the junior year, students gain a comprehensive grounding in the field through BENG 351, Biotransport and Kinetics, BENG 352, Biomedical Signals and Images, BENG 353, Introduction to Biomechanics, BENG 355L, Physiological Systems Laboratory, and BENG 356L, Biomedical Engineering Laboratory. During the junior and senior years students also acquire depth by taking electives in one of the three areas of concentration. A senior seminar and a senior project give students practical, detailed information about their chosen area of concentration.

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), and the two-term senior requirement.

Students in all tracks are required to take the following seven term courses: BENG 249, 350, 351, 352, 353, 355L, and 356L. Students in the Bioimaging track must also take three courses chosen from EENG 310, BENG 410, 421, 436, 445, 475, 476, or 485. Students in the Biomechanics track must also take three courses chosen from MENG 185, 280, 361, BENG 410, 434, 453, 455, 456, 457, or 458. Students in the Molecular Engineering track must also take three courses chosen from BENG 410, 434, 435, 464, 465, 467, or MENG 361. One relevant course may be substituted with the permission of the director of undergraduate studies. By the end of senior year, two term courses in the life sciences must have been included among the prerequisite and required courses for the major.

Senior requirement In their senior year, all students must complete a one-term senior project in their final term of enrollment (BENG 471 or 472) and the senior seminar (BENG 480).

Credit/D/Fail No course taken Credit/D/Fail may count toward the major, including prerequisites.

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 director of undergraduate studies.

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 (or CHEM 112 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 prereqs (incl senior req)

Specific courses required *All tracks*—BENG 249, 350, 351, 352, 353, 355L, 356L;
Bioimaging track—3 from EENG 310, BENG 410, 421, 436, 445, 475, 476, or 485;
Biomechanics track—3 from MENG 185, 280, 361, BENG 410, 434, 453, 455, 456, 457, or 458; *Molecular engineering track*—3 from BENG 410, 434, 435, 464, 465, 467, MENG 361.

Distribution of courses 2 term courses in life sciences among prereq and req courses
Substitution permitted Relevant course with DUS permission
Senior requirement Senior project in final term (BENG 471 or 472) and senior sem (BENG 480)

Courses

BENG 100b, Frontiers of Biomedical Engineering Staff

The basic concepts of biomedical engineering and their connection with the spectrum of human activity. Introduction to the fundamental science and engineering on which biomedical engineering is based. Topics include genetic engineering, cell culture engineering, vaccines, drug discovery and delivery, cardiovascular physiology, biomechanics, and biomedical imaging. Designed for science and non-science majors.
 SC

BENG 249b, Introduction to Biomedical Computation Richard Carson

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 251b / HLTH 251b, Biological and Physiological Determinants of Health Mark Saltzman

Overview of the biological and physiological functions that lead to a state of health in an individual and in a population. Cellular and molecular mechanisms of health explored in the context of major sources of global disease burden. Key physiological systems that contribute to health, including the endocrine, reproductive, cardiovascular, and respiratory systems. The development of technologies that enhance health and of those that harm it. Prerequisite: a college-level biology course or equivalent preparation. Does not fulfill premedical requirements. SC

* **BENG 350a / MCDB 310a, Physiological Systems** Mark Saltzman, Elizabeth Holt, Emile Boulpaep, Peter Aronson, and David Zenisek

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 351a / CENG 351a, 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

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 353b, Introduction to Biomechanics Jay Humphrey

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** Staff

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 404a / MENG 404a, Medical Device Design and Innovation Joseph Zinter

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 410a, Physical and Chemical Basis of Bioimaging and Biosensing** Douglas Rothman, Frederick Sigworth, Fahmeed Hyder, 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 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 445, Biomedical Image Processing and Analysis**]

BENG 455a, 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 463a / CENG 320a, 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. SC

BENG 464b, Tissue Engineering Laura Niklason

Introduction to the major aspects of tissue engineering, including materials selection, scaffold fabrication, cell sources, cell seeding, bioreactor design, and tissue characterization. Class sessions include lectures and hands-on laboratory work. Prerequisite: CHEM 161, 165, or 167 (or CHEM 112, 114, or 118). Recommended preparation: organic chemistry, cell biology, and physiology. SC 1½ Course cr

BENG 465a / MCDB 361a, Dynamical Systems in Biology Thierry Emonet, Damon Clark, and Kathryn Miller-Jensen

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. Use of MATLAB to create models. Prerequisite: MCDB 261 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 and BENG 472b, Special Projects** Staff

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 is usually taken during the spring term of the senior year but with permission of the director of undergraduate studies can be taken any time during a student's career, and may be taken more than once. Permission of both the instructor 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. After CPSC 112 and MATH 120, or with permission of instructor. QR, SC RP

*** BENG 480a, Seminar in Biomedical Engineering** Xenophon Papademetris
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.

*** BENG 485b, Fundamentals of Neuroimaging** Fahmeed Hyder

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. 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 Web site (<http://britishart.yale.edu/education/yale-college-students/yale-in-london>).

Inquiries may also be directed to yaleinlondon@yale.edu. The application deadline for spring term 2016 is Friday, October 2, 2015. Students will be notified of acceptance within one month of the application deadline. Inquiries about the summer program, described in the Undergraduate Curriculum section (p. 24), should be directed to the same address. Applications for summer 2016 are due Monday, February 15, 2016.

Courses

* **BRST 177b, British Art and Landscape** Martin Postle

The role of visual art in articulating cultural, literary, political, and environmental approaches to the landscape of the British Isles in the period from 1660 to 1860. Artists include Jan Siberechts, George Lambert, Thomas Gainsborough, Richard Wilson, J. M. W. Turner, and John Constable. HU

* **BRST 198b, Chaucer and Medieval London** Ardis Butterfield

Chaucer's writings explored through the human and physical landscape of medieval London and Westminster. The crowds, sounds, and visual stimuli of the city examined alongside literary genres in which the author wrote, including dream visions, love epic, and lyrics, as well as the comic, satiric, and religious narratives of his *Canterbury Tales*. Chaucer's sense of the writer's craft as a means of imagining space and sound and of depicting the emotional resonance of urban street scenes. HU

* **BRST 199b, Medieval Biography** Ardis Butterfield

The sources, aims, and diversity of medieval life-writing in its many forms, including autobiography, hagiography, political martyrology, and literary biography. What it means to conceive of the medieval world through the reading and writing of biography; the challenges of viewing a historical period primarily through a single life. Students work with special collections at major London museums, libraries, and galleries. Recommended preparation: reading knowledge of French. HU

* **BRST 478b, Modern British Drama** Sheila Fox

A detailed study of representative works of modern British drama, based on current productions on the London stage. Theatrical conventions developed by playwrights and actors in the theater of postwar Britain, both on the fringe and in the mainstream of the West End. Attention to social issues addressed by the plays. HU

Chemical Engineering

Director of undergraduate studies: Michael Loewenberg, 303 ML, 432-4334, michael.loewenberg@yale.edu; seas.yale.edu/departments/chemical-and-environmental-engineering

FACULTY OF THE DEPARTMENT OF CHEMICAL AND ENVIRONMENTAL ENGINEERING

Professors Eric Altman, † Michelle Bell, † Gaboury Benoit, † Stephen Edberg, Menachem Elimelech, Abbas Firoozabadi (*Adjunct*), † Thomas Graedel, Gary Haller, † Edward Kaplan, Yehia Khalil (*Adjunct*), Michael Loewenberg, Robert McGraw (*Adjunct*), Lisa Pfeifferle, Joseph Pignatello (*Adjunct*), Daniel Rosner, † James Saiers, † Mark Saltzman, † Udo Schwarz, T. Kyle Vanderlick, Paul Van Tassel, † Kurt Zilm

Associate Professors † Eric Dufresne, † Tarek Fahmy, Jaehong Kim, Chinedum Osuji, Jordan Peccia, Andre Taylor, Corey Wilson, Julie Zimmerman

Assistant Professors Drew Gentner, Desiree Plata

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

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 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; practice engineering toward the benefit of humankind.

Students considering a Chemical Engineering major are encouraged to take two terms of chemistry and mathematics during the freshman year, and to contact the director of undergraduate studies.

Requirements of the major 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).

Prerequisites Students in both degree programs take the following prerequisite courses: MATH 112, 115, and ENAS 151 or equivalent; PHYS 180, 181; CHEM 161 and 165, or CHEM 163 and 167 (or CHEM 114, 115), and CHEM 134L (or CHEM 116L), or CHEM 167 (or CHEM 118); ENAS 130. Students with advanced high school preparation may reduce the number of prerequisites.

B.S. degree program in Chemical Engineering The curriculum for the ABET-accredited B.S. degree in Chemical Engineering requires eighteen term courses, including the following courses beyond the prerequisites:

1. Mathematics: ENAS 194 or equivalent
2. Chemistry: CHEM 174 and 175 (or CHEM 124 and 125), or CHEM 220 and either 221 or 230; CHEM 332, 333, and 330L
3. Engineering science: MENG 361 and three term courses chosen from engineering electives
4. Chemical engineering: CENG 210, 300, 301, 315, 411, 412, 480

Senior requirement In their senior year students must pass CENG 416, Chemical Engineering Process Design.

B.S. degree program in Engineering Sciences (Chemical) The B.S. degree in Engineering Sciences (Chemical) requires ten term courses beyond the prerequisites, chosen in consultation with the director of undergraduate studies. The standard program includes the following courses:

1. Mathematics: ENAS 194 or equivalent
2. Chemistry: CHEM 174 and 175 (or CHEM 124 and 125), or CHEM 220 and either 221 or 230, or CHEM 332 and 333
3. Engineering science: MENG 361
4. Chemical engineering: CENG 210, 300, 301, 315, 411

Senior requirement In their senior year students must complete a senior research project in CENG 490.

REQUIREMENTS OF THE MAJOR CHEMICAL ENGINEERING, B.S.

Prerequisites MATH 112, 115, ENAS 151 or equivalent; CHEM 161 and 165, or CHEM 163 and 167 (or CHEM 114, 115), and CHEM 134L (or CHEM 116L), or CHEM 167 (or CHEM 118); PHYS 180, 181; ENAS 130

Number of courses 18 term courses beyond prereqs (incl senior req)

Specific courses required ENAS 194 or equivalent; CHEM 174 and 175 (or CHEM 124 and 125), or CHEM 220 and either 221 or 230; CHEM 332, 333, and 330L; MENG 361; CENG 210, 300, 301, 315, 411, 412, 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 equivalent; CHEM 161 and 165, or CHEM 163 and 167 (or CHEM 114, 115), and CHEM 134L (or CHEM 116L), or CHEM 167 (or CHEM 118); PHYS 180, 181; ENAS 130

Number of courses 10 term courses beyond prereqs (incl senior req)

Specific courses required ENAS 194 or equivalent; CHEM 174 and 175 (or CHEM 124 and 125), or CHEM 220 and either 221 or 230, or CHEM 332 and 333; MENG 361; CENG 210, 300, 301, 315, 411

Senior requirement CENG 490

*** CENG 120b / ENAS 120b / ENVE 120b, Introduction to Environmental Engineering**

Jordan Peccia

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 210a / ENVE 210a, Principles of Chemical Engineering and Process Modeling

André Taylor

Analysis of the transport and reactions of chemical species as applied to problems in chemical, biochemical, and environmental systems. Emphasis on the interpretation of laboratory experiments, mathematical modeling, and dimensional analysis. Lectures include classroom demonstrations. Prerequisite: MATH 120 or permission of instructor.

QR, SC RP

CENG 300a, Chemical Engineering Thermodynamics Chinedum Osuji

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 André Taylor

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 Michael Loewenberg

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 320a / 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. SC

CENG 351a / BENG 351a, 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 Drew Gentner

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 210. 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 410a, Biomolecular Engineering Corey Wilson

A survey of the principles and scope of biomolecular engineering. Discussion of concepts at the interface of applied mathematics, biology, biophysical chemistry, and chemical engineering that are used to develop novel molecular tools, materials, and approaches based on biological building blocks and machinery. Modeling the physicochemical properties that confer function in biological systems; low- and high-resolution protein engineering; the design of synthetic interactomes. RP

CENG 411a, Separation and Purification Processes Lisa Pfefferle

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 Paul Van Tassel and Corey Wilson

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 Paul Van Tassel and Corey Wilson

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 Mitchell Smooke

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

Directors of undergraduate studies: Kurt Zilm, 119 SCL, 432-3956, kurt.zilm@yale.edu [F]; Patrick Vaccaro, 240 SCL, 432-3975, patrick.vaccaro@yale.edu [Sp]; www.chem.yale.edu

FACULTY OF THE DEPARTMENT OF CHEMISTRY

Professors † Sidney Altman, Victor Batista, Gary Brudvig, Robert Crabtree, † Craig Crews, R. James Cross, Jr. (*Emeritus*), Jonathan Ellman, John Faller (*Emeritus*), † Gary Haller, Seth Herzon, Patrick Holland, † Francesco Iachello, Mark Johnson, William Jorgensen, J. Patrick Loria, James Mayer, J. Michael McBride (*Emeritus*), Scott Miller, Peter Moore (*Emeritus*), † Anna Pyle, † Lynne Regan, † James Rothman, Martin Saunders, Alanna Schepartz, Charles Schmuttenmaer, † Dieter Söll, David Spiegel, † Thomas Steitz, † Scott Strobel, John Tully (*Emeritus*), Patrick Vaccaro, Elsa Yan, Frederick Ziegler (*Emeritus*), Kurt Zilm

Associate Professor Nilay Hazari

Assistant Professors Richard Baxter, Jason Crawford, Ziad Ganim, Timothy Newhouse, Sarah Slavoff, Hailiang Wang

Lecturers Paul Anastas, Christine DiMeglio, N. Ganapathi, Jonathan Parr

† A joint appointment with primary affiliation in another department.

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.

Introductory courses and placement The majority of students begin with a general chemistry sequence: either CHEM 161 and 165, General Chemistry I and II, or CHEM 163 and 167, Comprehensive University Chemistry I and II. Any of these courses fulfills 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 may even have taken AP chemistry but not fully mastered 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 shown other evidence of high achievement in science and mathematics may be given placement to start in CHEM 167. For instance, students with a Chemistry Advanced Placement test score of 5 may usually elect CHEM 167.

Students with a sufficiently strong background in chemistry may initiate their studies with courses in organic, inorganic, or physical chemistry after demonstrating proficiency on the department's placement examination. CHEM 174 and 175, Freshman Organic Chemistry I and II, and CHEM 185, Freshman Inorganic Chemistry, are offered expressly for freshmen. Other courses in organic chemistry, including CHEM 220, 221, and 230, are also available to qualified freshmen. Students with a strong background in physics and calculus may be eligible for the physical chemistry courses CHEM 332 and 333.

Placement procedures The Chemistry department reviews the preparation of all freshmen prior to the beginning of the fall term, using test scores, admission records, and information supplied by students. Incoming students should see the Freshman Web site (<http://yalecollege.yale.edu/new-students/class-2019/academic-information/special-programs-placement-and-preregistration-1>) for details on information to submit during the summer before matriculation. The department determines the appropriate general chemistry course for every entering freshman, either CHEM 161, 163, or 167. Students will be able to view their initial placement in late August on the "Chem Placement 2015" site on Classes*v2 (<https://classesv2.yale.edu/portal>); instructions are available on the Freshman Web site (<http://yalecollege.yale.edu/new-students/class-2019/academic-information/special-programs-placement-and-preregistration-0>).

Freshmen wishing to take CHEM 174, 185, 220, or 332, or those wishing to take a higher-level course than their initially assigned placement, 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 freshmen.

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 183 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 nonprogrammable, nongraphing 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*. After the examination, final placements are posted on the "Chem Placement 2015" site on Classes*v2 (<https://classesv2.yale.edu/portal>). For further information about placement and the examination, consult the *Calendar for the Opening Days of College* and the Freshman Web site (<http://yalecollege.yale.edu/new-students/class-2019/academic-information/special-programs-placement-and-preregistration-1>).

Permission keys Enrollment in any introductory chemistry course requires an electronic permission key. Keys are issued automatically by the department for entering freshmen 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, 183 SCL.

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 Online Course Information (<http://www.yale.edu/oci>). Due to the nature of laboratory exercises, it is impractical to preview laboratory courses during the course selection period.

Placement information for upperclassmen Upperclassmen wishing to take CHEM 161, 163, 165, or 167 should confirm their placement at the Chem Placement site on Classes*v2 (<https://classesv2.yale.edu/portal>) that corresponds to their year of matriculation. If permission keys are needed, upperclassmen should obtain them by inquiring at the department office, 183 SCL. Those wishing to enroll in CHEM 220 may do so as long as they have satisfied the general chemistry prerequisite.

Information 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 CHEM 167 and 185, 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 (<http://ocs.yale.edu/content/health-professions-o>) for the most up-to-date premedical course advice.

Major degree programs 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 can also 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 for the Class of 2016 Students in the Class of 2016 may fulfill the requirements of the major that were in place when they entered the major in Chemistry, as described in previous editions of this bulletin (<http://www.yale.edu/printer/bulletin/archivpdf/files/YCPS>). Alternatively, they may fulfill the requirements for the major as described below for the Class of 2017 and subsequent classes.

The major for the Class of 2017 and subsequent classes 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. No chemistry courses taken Credit/D/Fail may be counted toward the major (including substitutions for advanced courses).

Prerequisites common to all Chemistry degree programs 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, are prerequisite to all four degree programs. Students are also encouraged to complete a course in multivariable calculus (MATH 120 or ENAS 151).

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 185 or 252).

B.A. degree In addition to the prerequisites and common degree requirements, 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 In addition to the prerequisites and common degree requirements, 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, intensive major In addition to the prerequisites and common degree requirements, 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 program in Chemistry 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 grades of A or A– earned to continue in the program. The B.S./M.S. degree program requires completion of the intensive major requirements. The introductory physics requirement must be fulfilled with PHYS 200, 201 or 260, 261; a term course in physics numbered 400 or higher and approved by the director of undergraduate studies 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 year course) and have at least a B average in the remaining ones. B.S./M.S. candidates are also expected to continue their independent research in a summer internship between their junior and senior years. For more information, see “Simultaneous Award of the Bachelor’s and Master’s Degrees” in section K (p. 65) of the Academic Regulations (p. 33).

Advanced courses For the purposes of degree requirements, all undergraduate Chemistry courses numbered 410 or higher count as advanced lecture or laboratory courses, as do CHEM 226L, 251L, and 331L. Because most advanced courses either are offered in 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. Most graduate-level Chemistry courses may also count toward the advanced-course requirement; consult the director of undergraduate studies for information about eligible courses.

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 director of undergraduate studies. 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.

Senior requirement for the B.A. degree 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 fifteen to twenty-five

pages in length (double-spaced, twelve-point font, exclusive of figures, tables, and bibliography).

Senior requirement for the B.S. degree 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 fifteen to twenty-five pages in length (double-spaced, twelve-point font, exclusive of figures, tables, and bibliography). All students performing research must also present their work in the form of an oral or poster presentation as coordinated by the instructor of CHEM 490.

Senior requirement for the B.S. degree 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 fifteen to twenty-five pages (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 must also present their work in the form of an oral or poster presentation as coordinated by the instructor of CHEM 490.

Sequence of courses Majors are encouraged to begin their programs in the freshman 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:

Freshman	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

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, Chemical Biology, and two biochemistry electives chosen from MCDB 300, MB&B 300, 301, or selected graduate courses. An inorganic chemistry specialization could include CHEM 450, Physical Methods in Inorganic Chemistry, CHEM 452, Organometallic Chemistry, and CHEM 457, Modern Coordination Chemistry. A program with emphasis in physical chemistry and chemical physics would have three electives chosen from CHEM 430, Statistical Mechanics and Thermodynamics, CHEM 440, Molecules and Radiation I, CHEM 442, Molecules and Radiation II, CHEM 470, Introductory Quantum Chemistry, or a graduate course in quantum mechanics. Students interested in synthetic organic chemistry complete three electives chosen from CHEM 418, Advanced Organic Chemistry I, CHEM 423, Synthetic Methods in Organic Chemistry, CHEM 425, Spectroscopic Methods of Structure Determination, 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 director of undergraduate studies. For a list of graduate courses appropriate for a particular specialization, consult the director of undergraduate studies.

Approval of major programs of study All Chemistry majors in the sophomore, junior, and senior years must have their programs approved by the director of undergraduate studies. 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 director of undergraduate studies or by any of the advisers to the major. A current list of advisers to the major may be obtained in the department office.

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 CHEM 175, 221 or 230; and CHEM 332 or 328, and CHEM 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 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 have already 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 director of undergraduate studies. Students dropping the lecture course corequisite with a laboratory must also drop the laboratory course.

Year or Term 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 section K (p. 65) of the Academic Regulations.

REQUIREMENTS OF THE MAJOR

Prerequisites CHEM 161 and 165, or 163 and 167 (or CHEM 112, 113; or 114, 115; or 118); CHEM 134L and 136L (or CHEM 116L, 117L); 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); physical chem I (CHEM 332 or 328); 1 term of inorganic chem (CHEM 185 or 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

Courses for Nonmajors without Prerequisites

[CHEM 101, Chemistry in the Modern World]

CHEM 102b / ENVE 202b / EVST 102b, Introduction to Green Chemistry Paul Anastas

Overview of the basic concepts and methods needed to design processes and synthesize materials in an environmentally benign way. Related issues of global sustainability. Case studies that suggest possible solutions for the serious environmental and toxicological issues currently facing industry and society. Intended for non-science majors with a basic high school background in chemistry and physics, as well as high school algebra. Does not satisfy premedical chemistry requirements or requirements for the Chemistry major.

CHEM 104b, Chemistry of Food and Cooking Elsa Yan and Narasimhan Ganapathi
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. SC

Introductory Courses

Freshmen 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 must also register in person and take a placement examination as described in the Chemistry department program description and on the Freshman Web site (<http://yalecollege.yale.edu/content/chemistry-1>). 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. 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 Freshman Web site (<http://yalecollege.yale.edu/content/chemistry-1>).

[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 and Jonathan Parr

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. For students with a good 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** Jonathan Parr

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 167a or b, 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, Freshman Organic Chemistry 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, Freshman Organic Chemistry II** Alanna Schepartz

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

* **CHEM 185b, Freshman Inorganic Chemistry** Patrick Holland

The roles of metals and metal ions in the environment, biological systems, medicines, catalysts, and materials. Concepts of inorganic chemistry and their relation to chemistry fundamentals and applications. Attendance at a weekly discussion section required.

Prerequisite: CHEM 167, or with equivalent placement. 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 226Lb, Intensive Advanced Chemistry Laboratory** Christine DiMeglio

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. For enrollment procedures, contact the instructors.

WR, SC RP

[CHEM 230, Organic Chemistry of Biological Pathways]

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 Robert Crabtree

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

Richard Baxter

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, Laboratory for Physical Chemistry I Patrick Vaccaro and Narasimhan Ganapathi

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 331L, Laboratory for Physical Chemistry II]***CHEM 332a, Physical Chemistry with Applications in the Physical Sciences I**

R. James Cross

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

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** William Jorgensen

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 Jason Crawford and Sarah Slavoff

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 RP

CHEM 423a, Synthetic Methods in Organic Chemistry 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 425, Spectroscopic Methods of Structure Determination**]

[**CHEM 426, Computational Chemistry and Biochemistry**]

CHEM 430a, Statistical Mechanics and Thermodynamics Ziad Ganim
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 Martin Saunders
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 Mark Johnson
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 Nilay Hazari
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 470b, Quantum Chemistry Victor Batista

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 490a or b, Independent Research in Chemistry** Jonathan Parr

After consulting with the director of undergraduate studies no later than the last week of the preceding academic term, students choose to work on individual laboratory and/or theoretical research problems under the supervision of a faculty member in Chemistry or in a closely related field of molecular science. Mandatory class meetings address issues of essential laboratory safety and ethics in science, with other class sessions focusing on core topics of broad interest including chemistry literature searching, oral presentation skills, and effective scientific writing. At least ten hours of research required per week. May be taken multiple times for credit. For each term of enrollment, students must complete a CHEM 490 registration form, have it signed by their research adviser and the course instructor, and submit it to the director of undergraduate studies for final approval no later than the last week of the preceding term. 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 (<http://www.yale.edu/printer/bulletin/htmlfiles/grad>) 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.

Child Study Center

The Yale Child Study Center is an interdisciplinary department at the School of Medicine that furthers understanding of the problems of children and families. Among the coordinated disciplines are child psychiatry, pediatrics, genetics, neurobiology, epidemiology, psychology, nursing, social work, and social policy. The mission of the 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 local, state, national, and international collaborations in research, clinical services, training programs, and policy work. More information is available on the Center's Web site (<http://medicine.yale.edu/childstudy>).

Courses

*** CHLD 125a / EDST 125a / PSYC 125a, Child Development** Nancy Close

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. SO ½ Course cr

* **CHLD 127a / EDST 127a / PSYC 127a, Theory and Practice of Early Childhood Education: Implications of Curriculum and Policy** Carla Horwitz

Development of curricula for preschool children – infants through five-year-olds – in light of current research and child development theory. WR, SO RP

* **CHLD 128b / EDST 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

* **CHLD 131a / EDST 131a / HLTH 270a, The Growing Child in Global Context** Erika Christakis

The effects of poverty, changing demographic and workforce trends, and access to early education and child care on the growing child around the world. Topics include antenatal care, mental and behavioral health, malnutrition and obesity, family support, schooling, sex selection and gender bias, parenting practices, migration and warfare, and child policy challenges in diverse cultural and socioeconomic contexts. SO

* **CHLD 132a or b / PSYC 132a or b / SOCY 132a or b, The Concept of the Problem Child** Erika Christakis

Differing visions of good and bad, typical and atypical, children. Reasons why some children are seen as deviant and others as normal. Implications for public policy, medical practice, family dynamics, schooling, and the criminal justice and protective care systems. Sources include public health data, early childhood curricula, and depictions of problem children in literature and popular culture. SO

* **CHLD 133a / PSYC 133a, Introduction to Developmental Psychopathology** Fred Volkmar, Eli Lebowitz, and Wendy Silverman

Overview of developmental psychopathology during childhood and adolescence. Aspects of normal development, assessment methods, clinical disorders, treatment, and legal and social policy issues. Theoretical approaches to understanding developmental aspects of common mental health conditions in childhood. Some attention to issues of culture and ethnicity in the expression of psychopathology. Prerequisite: PSYC 130, 140, or equivalent, or with permission of instructor.

* **CHLD 350a or b / PSYC 350a or b, Autism and Related Disorders** Staff

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: Pauline LeVen, 305 Phelps, 432-0983,
pauline.leven@yale.edu; www.yale.edu/classics

FACULTY OF THE DEPARTMENT OF CLASSICS

Professors Egbert Bakker, Victor Bers, Kirk Freudenburg, Emily Greenwood, Verity Harte, Brad Inwood, Diana Kleiner, Christina Kraus, Noel Lenski, Joseph Manning

Associate Professors Milette Gaifman, Pauline LeVen, Irene Peirano Garrison

Assistant Professors Joshua Billings, Andrew Johnston

Lecturers Ann Ellis Hanson, Susan Matheson, Timothy Robinson, Barbara Shailor, Joseph Solodow

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.

Placement policy 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. Freshmen are encouraged to take advantage of the initial course selection period before course schedules are due to find the most appropriate course.

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, 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 both 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), a survey of the literature and culture of ancient Rome (CLCV 257), and two additional courses in related areas of history and art. The language courses must include GREK 390 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 who have completed CLCV 254 and 255 in the past may count them toward the survey requirements in the literature and culture of Athens and Rome, respectively.

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), a survey of the literature and culture of ancient Rome (CLCV 257), 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 390 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) in the second language for two 400-level courses in the major literature. Students who have completed CLCV 254 and 255 in the past may count them toward the survey requirements in the literature and culture of Athens and Rome, respectively.

Senior requirement At the end of the senior year the student majoring in both literatures takes a comprehensive examination in the history of Greek and Latin literature and in translation of both languages; the student majoring in one literature takes a senior departmental examination in the history of the literature of the major and in translation of that literature.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

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. 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 September 2 of the senior year. The candidate must submit two copies of the senior essay to the director of undergraduate studies no later than December 11 (CLSS 492a) or April 22 (CLSS 490, 491 or CLSS 492b) of the senior year.

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 "Simultaneous Award of the Bachelor's

and Master's Degrees" under section K, Special Arrangements (p. 65), in the Academic Regulations. Interested students should consult the director of undergraduate studies prior to the sixth term of enrollment for specific requirements in Classics.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 10 term courses

Specific courses required GREK 390 or LATN 390; CLCV 256 or 254, and 257 or 255

Distribution of courses *Two literatures*—6 courses in both langs at level 390 or above, with 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 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

Senior requirement Senior dept exam in hist and translation of Greek and Latin lit (*two lits*) or major lit (*one lit*)

Intensive major Senior essay (CLSS 490, 491 or CLSS 492) in addition to above

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, though 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 seminar) 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) and a survey of the literature and culture of ancient Rome (CLCV 257); those who have completed CLCV 254 and 255 in the past may count these courses toward the survey requirements. 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.

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). A brief prospectus of the project must be submitted to the director of undergraduate studies, preferably at the end of the junior

year and in no case later than September 2 of the senior year. The completed project must be submitted to the department no later than December 11 (CLCV 452a) or April 22 (CLCV 450, 451 or CLCV 452b) of the senior year. If the student has written an essay, two copies are required.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

Approval of schedules Programs for all majors must be approved by the director of undergraduate studies.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 12 term courses (incl two-term senior sem)

Specific courses required CLCV 256 or 254, and 257 or 255

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

Senior requirement Senior project (CLCV 450, 451 or CLCV 452)

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), a survey of the literature and culture of ancient Rome (CLCV 257), and one term course in ancient Greek history. The language courses should include GREK 390. Students who have completed CLCV 254 and 255 in the past may count them toward the survey requirements in the literature and culture of Athens and Rome, respectively. 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.

Senior requirement At the end of the senior year the student takes a comprehensive examination in the history of Greek literature.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

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. 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 September 2 of the senior year. The candidate must submit two copies of the senior essay to the director of undergraduate studies no later than December 11 (CLSS 492a) or April 22 (CLSS 490, 491, or CLSS 492b) of the senior year.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 10 term courses

Specific courses required GREK 390; CLCV 256 or 254, and 257 or 255

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

Senior requirement Senior dept exam

Intensive major Senior essay (CLSS 490, 491 or CLSS 492) in addition to above

Greek

GREK 110a, Beginning Greek: The Elements of Greek Grammar Kyle Khellaf
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 Staff
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 Emily Hauser
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 Staff

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 390a, Greek Syntax and Stylistics Victor Bers

A review of accidence and syntax, elementary composition, and analysis of Greek prose styles of the fifth and fourth centuries B.C., including a comparison of "prosaic" and "poetic" syntax. Prerequisite: previous familiarity with some Greek prose beyond the elementary level, or permission of instructor. L5, HU

*** GREK 413a, Alcibiades and Socrates in Plato's Dialogues** Brad Inwood

Introduction to the close reading, in Greek, of a platonic dialogue as both a literary and a philosophical form, with a focus on the portrayals of Alcibiades and Socrates in Plato's *Alcibiades* and *Symposium*. Debates about the comparison of Plato's characters to the historical figures. How the characters and drama relate to the philosophy, and how different dialogues are related to each other. Prerequisites: GREK 131 and 141 or equivalents. A bridge course between L4 and other L5 courses. L5, HU

*** 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

*** GREK 455a, Athenian Law Courts** Victor Bers

Rhetoric and law, procedural and substantive, in the Athenian courts of the fifth and fourth centuries B.C. as seen in forensic speeches and discursive treatments, and as satirized in Aristophanes' *Wasps*. L5

*** GREK 471b, Plutarch's *Lives*** Emily Greenwood

Close reading of selections from the *Parallel Lives*, including the lives of Pericles, Alcibiades, and Nicias. Plutarch's reception and mediation of Greco-Roman historical traditions; the nature and design of the *Lives*; ways in which genres such as biography, history, and historical fiction influenced and were influenced by Plutarch's work. 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 Staff

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 Staff

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 411a, Early Rome from Aeneas to Romulus Michael Zimm

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 429a, The Roman World of the Plinys** Andrew Johnston

The Roman world of the Flavian Age and the principate of Trajan (c. 70–110 C.E.) as seen through the writings of two of its public intellectuals, Pliny the Elder and his nephew Pliny the Younger. The former's encyclopedic *Natural History* and the latter's *Letters* and *Panegyric*. Politics, physical science, history, literature, zoology, magic, patronage, art history, and slavery during the period. Prerequisite: LATN 131 or equivalent. L5, HU

LATN 433b, Sallust Christina Kraus

An introduction to the works, style, and thought of Sallust. Close reading and discussion of Sallust's two main works, the *Bellum Catilinae* and *Bellum Jugurthinum*, with attention to language and style. Topics include historiography as a genre, intertextuality, the Sallustian persona and style, ethnography, and characterization. L5, HU

* **LATN 464a, Ovid's *Metamorphoses*** Joseph Solodow

An intensive introduction to the *Metamorphoses*, with particular attention to questions of narrative, gender, politics, and literary history. L5

Classics

* **CLSS 422a / PHIL 422a, Plato's Republic** Verity Harte and Mary McCabe

Close reading and philosophical analysis of the whole of Plato's *Republic*. Readings in translation. Prerequisites: PHIL 125 or DRST 003 or equivalent, and one additional philosophy course. HU

* **CLSS 430a, Medical Thought in Greek and Latin Literature** Ann Hanson

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 and CLSS 491b, Two-Term Senior Essay for the Intensive Major in Classics** Staff

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 or b, One-Term Senior Essay for the Intensive Major in Classics Staff
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 056b, Ancient Myth, Fiction, and Science Fiction** Pauline LeVen

A survey of ancient Greek and Roman myths and an introduction to the prose fiction and science fiction of 2500 years ago. Crucial questions asked by Greek and Roman myths; how myths were an integral part of important ancient institutions; ways in which myths, fiction, and science fiction represented the world and the notion of "truth" in different ways. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **CLCV 057a / HIST 021a, The Age of Constantine** Noel Lenski

The world of late antiquity explored through the pivotal figure of Constantine the Great, Rome's first Christian ruler. Focus on the third and fourth centuries C.E. Themes of politics, religion, society and economy, history of art and architecture, warfare, administration, foreign policy, and multiculturalism. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **CLCV 059b / ARCG 020b / EVST 030b / HIST 020b / NELC 026b, Rivers and Civilization** Joseph Manning and 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. Includes a week-long field trip to Turkey. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU, SO

* **CLCV 113a / HUMS 434a / NELC 230a, Mesopotamia's Literary Legacy** Kathryn Slanski

Major works of ancient Near Eastern literature; relationships with literary traditions in the Hebrew Bible and ancient Greece. Readings include myths, epics, wisdom literature, love poetry, and humorous stories. HU

CLCV 115a, Classical Mythologies Kirk Freudenburg

An introduction to myths and their cultural context, with emphasis on Greek mythology. The wider application of myth to human concerns such as creation, gender, identity, and death. Methods of modern myth analysis applied to ancient, medieval, and modern mythology. WR, HU

CLCV 125a / PHIL 125a, Introduction to Ancient Philosophy Brad Inwood

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. HU

CLCV 161b / ARCG 161b / HSAR 247b, Art and Myth in Greek Antiquity Milette Gaifman

Visual exploration of Greek mythology through the study of ancient Greek art and architecture. Greek gods, heroes, and mythological scenes foundational to

Western culture; the complex nature of Greek mythology; how art and architecture rendered myths ever present in ancient Greek daily experience; ways in which visual representations can articulate stories. Use of collections in the Yale University Art Gallery. HU

CLCV 175a / ARCG 252a / HSAR 252a, 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 204b / HIST 300b, Alexander the Great and the Hellenistic World Joseph Manning

The history and culture of the ancient world between the rise of Macedonian imperialism in the fourth century B.C.E. and the annexation of Egypt by Augustus in 30 B.C.E. Particular attention to Alexander, one of the most important figures in world history, and to the definition of "Hellenism." HU

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

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, 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 221b / LITR 166b, Imperialisms Ancient and Modern** Christina Kraus
Works of Greek and Latin literature that address the material advantages furnished by imperialism and the moral cost at which they are purchased. Comparison with films, graphic novels, and art installations that engage with similar issues in relation to modern empires. Current problems of globalization and imperialism situated in the context of historical empires. HU

CLCV 234a / HIST 464a, Egypt and the Classical World in the First Millennium B.C.
Joseph Manning

The history of Egypt from the end of the pharaonic period through encounters with the Greek, Persian, and Roman worlds. The unusual position of Egypt in the long history of the Mediterranean; the transformation of Egyptian society during the

first millennium B.C., a time of momentous change across western Asia and the Mediterranean world. HU

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 256a, Ancient Athenian Civilization** Emily Greenwood

Introduction to the city of ancient Athens and its political institutions, culture, society, and history from 510 to 323 B.C. Topics include politics, law, economics, intellectual culture, drama and performance, sex and reproduction, immigration, warfare, and the environment. The creation of political and cultural forms that continue to influence contemporary debates. HU

CLCV 257b, Cultural Introduction to the Romans Noel Lenski

An introduction to ancient Roman culture. Focus on the ideals of elite identity and on the lives that were lived on the margins of those ideals, by slaves, prostitutes, freedmen, gladiators, foreigners, and the urban poor. Rome both as a city of grandeur and pageantry and as a place of unthinkable cruelty and injustice. HU

* **CLCV 319b / HIST 242Jb / MGRK 300b / WGSS 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

* **CLCV 408a / HIST 288Ja, Athenian Imperial Democracy** Donald Kagan

A history of Greece in the years between the Persian invasion and the Peloponnesian War, with emphasis on Athens. HU

* **CLCV 450a and CLCV 451b, Two-Term Senior Project for the Major in Classical Civilization** Pauline LeVen

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 or b, One-Term Senior Project for the Major in Classical Civilization** Pauline LeVen

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.

* **CLCV 494a or b, Independent Tutorial in Classical Civilization** Pauline LeVen

For students who wish to pursue a specialized subject in classical civilization not otherwise covered in courses. Students are expected to provide a detailed reading list and a clear outline of their project early in the term. The work should result in a term paper or examination. A limited number of these courses may be offered toward the major. Readings in translation. Offered subject to faculty availability.

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, 102 C, 432-1699,
joshua.knobe@yale.edu; www.yale.edu/cogsci

FACULTY ASSOCIATED WITH THE PROGRAM IN COGNITIVE SCIENCE

Professors Woo-kyoung Ahn (*Psychology*), Stephen Anderson (*Linguistics*), Amy Arnsten (*School of Medicine*), John Bargh (*Psychology*), Paul Bloom (*Chair*) (*Psychology*), Hal Blumenfeld (*School of Medicine*), Marvin Chun (*Psychology*), Michael Della Rocca (*Philosophy*), Ravi Dhar (*School of Management*), Julie Dorsey (*Computer Science*), Carol Fowler (*Adjunct*) (*Psychology*), Robert Frank (*Linguistics*), David Gelernter (*Computer Science*), Tamar Gendler (*Philosophy*), Laurence Horn (*Emeritus*) (*Linguistics*), Marcia Johnson (*Psychology*), 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*), Rhea Paul (*School of Medicine*), Kevin Pelphrey (*School of Medicine*), Kenneth Pugh (*School of Medicine*), Ian Quinn (*Music*), Holly Rushmeier (*Computer Science*), Laurie Santos (*Psychology*), Brian Scassellati (*Computer Science, Mechanical Engineering*), Brian Scholl (*Psychology*), Sun-Joo Shin (*Philosophy*), Zoltán Szabó (*Philosophy*), Fred Volkmar (*School of Medicine*), Xiao-Jing Wang (*School of Medicine*), David Watts (*Anthropology*), Bruce Wexler (*School of Medicine*), Karen Wynn (*Psychology*), Raffaella Zanuttini (*Linguistics*), Steven Zucker (*Computer Science, Biomedical Engineering*)

Associate Professors Daylian Cain (*School of Management*), James Mazer (*School of Medicine*), Maria Piñango (*Linguistics*)

Assistant Professors Yarrow Dunham (*Psychology*), Hedy Kober (*School of Medicine*), George Newman (*School of Management*), David Rand (*Psychology*), Gregory Samanez-Larkin (*Psychology*)

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.

Introductory course 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 Fourteen term courses, for a total of thirteen 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 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, PSYC 553
3. Linguistics: LING 110, 116, 117, 130, 232, 253
4. Neuroscience: CGSC 201, MCDB 320, PSYC 160, 270
5. Philosophy: PHIL 126, 181, 269, 270, 271
6. Psychology: PSYC 110, 140, 304

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 director of undergraduate studies. 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 director of undergraduate studies, 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 director of undergraduate studies. The skills requirement for the B.S. is fulfilled by PSYC 200 or an equivalent course in statistics.

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.

Senior requirement In the senior year, students take CGSC 491, a half-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.

B.S. degree 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 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.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the requirements of the major, except with permission of the director of undergraduate studies.

Application to the major Students may apply to enter the major at any point after the freshman year. Applications must be made in writing to the director of undergraduate studies. Applications must include (a) an official or unofficial transcript of work at Yale, (b) a brief statement of purpose, which indicates academic interests and expected focus within the areas of the Cognitive Science major, and (c) 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 Web site (http://www.yale.edu/cogsci/info_undergrad.html).

REQUIREMENTS OF THE MAJOR

Prerequisite CGSC 110

Number of courses 14 term courses, for a total of 13 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; 6 courses in a specific topic or area, as specified; 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

Introductory Courses

CGSC 110a / PSYC 130a, Introduction to Cognitive Science April Ruiz

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 135a / HIST 118a / HSHM 216a / PSYC 135a, Minds and Brains in America
Henry Cowles

A survey of the science and medicine of mind and brain in America since 1800. Madness and the asylum; phrenology and psychoanalysis; psychology in politics, law, and advertising; the rise of the "neuro-" disciplines; mental health in public life. Texts from

fields such as neurology, physiology, psychology, psychiatry, and philosophy. May not be taken after HSHM 409. WR, HU

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

Advanced Courses

CGSC 304a / PSYC 304a, The Mental Lives of Babies and Animals Karen Wynn

Interdisciplinary exploration of the cognitive, social, and emotional capacities of creatures lacking language and culture. The extent to which our complex psychology is unique to mature humans; the relative richness of a mental life without language or culture. Some attention to particular human populations such as children with autism and adults with language disorders. SO

* **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 390a, Junior Seminar in Cognitive Science** Mark Sheskin

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 413b / PSYC 413b, Mind, Brain, and Society** Marvin Chun

Recent advances in modern neuroscience as they inform or complicate issues in society. Views from disciplines such as psychology, philosophy, economics, political science, law, and religion. SO

* **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

Courses for Majors

* **CGSC 395b, Junior Colloquium in Cognitive Science** Mark Sheskin

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** Mark Sheskin

A research colloquium leading to the completion of the senior essay. Students attend regular colloquium presentations. Enrollment limited to Cognitive Science majors.

½ Course cr

Related Courses That May Count toward the Major

* **CHLD 350a or b / PSYC 350a or b, Autism and Related Disorders** Staff
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 Y. Richard Yang

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 Stephen Slade

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

Math: Stat/Applied Math

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 470a, Artificial Intelligence Drew McDermott

Introduction to artificial intelligence research, focusing on reasoning and perception. Topics include knowledge representation, predicate calculus, temporal reasoning, vision, robotics, planning, and learning. After CPSC 201 and 202. QR

[CPSC 471, Advanced Topics in Artificial Intelligence]**ECON 159b, Game Theory** Barry Nalebuff

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 Jim Wood

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 117a / PSYC 137a, Language and Mind Maria Piñango

Knowledge of language as a component of the mind: mental grammars, the nature and subdivisions of linguistic knowledge in connection with the brain. The logical problem of language acquisition. The "universal grammar hypothesis" according to which all humans have an innate ability to acquire language. The connection between language acquisition and general cognitive abilities. SO

[LING 130, Evolution of Language]**LING 220b / PSYC 318b, General Phonetics** Ryan Bennett

Investigation of possible ways to describe the speech sounds of human languages. Acoustics and physiology of speech; computer synthesis of speech; practical exercises in producing and transcribing sounds. SO

*** LING 224a, Formal Foundations of Linguistic Theories** Staff

Study of formal systems that play an important role in the scientific study of language. Exploration of a range of mathematical structures and techniques; demonstrations of their application in theories of grammatical competence and performance including set theory, graphs and discrete structures, algebras, formal language, and automata theory. Evaluation of strengths and weaknesses of existing formal theories of linguistic knowledge. QR, SO

LING 227b / PSYC 327b, Language and Computation Staff

Design and analysis of computational models of language. Topics include finite state tools, computational morphology and phonology, grammar and parsing, lexical semantics, and the use of linguistic models in applied problems. Prerequisite: Prior programming experience or permission of instructor. QR, SO

LING 231b / PSYC 331b, Neurolinguistics Maria Piñango

The study of language as a cognitive neuroscience. The interaction between linguistic theory and neurological evidence from brain damage, degenerative diseases (e.g., Alzheimer's disease), mental illness (e.g., schizophrenia), neuroimaging, and neurophysiology. The connection of language as a neurocognitive system to other systems such as memory and music. SO

LING 232a, Introduction to Phonological Analysis Ryan Bennett

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. (Formerly LING 132) SO

*** LING 235b, Phonological Theory** Staff

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

An introduction to the syntax of natural language. Generative syntactic theory and key theoretical concepts. Syntactic description and argumentation. Topics include the structure of clauses and noun phrases, movement operations, and the notion of parameter. (Formerly LING 153) SO

LING 254b, Syntax II Robert Frank

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 Ashwini Deo

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 280b, Morphology** Stephen Anderson

The theory of word structure within a formal grammar. Relation to other areas of grammar (syntax, phonology); basic units of word structure; types of morphology (inflection, derivation, compounding). Prerequisites: LING 232 and 253, or permission of instructor. SO

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. After a 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 267a, 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
Math: Logic/Foundations

PHIL 270a, Epistemology Keith DeRose

Introduction to current topics in the theory of knowledge. The analysis of knowledge, justified belief, rationality, certainty, and evidence. 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 140a, Developmental Psychology Frank Keil

An introduction to research and theory on the development of perception, action, emotion, personality, language, and cognition from a cognitive science perspective. Focus on birth to adolescence in humans and other species. Prerequisite: PSYC 110. SO
Psychology: Core
Psychology: Social Science

PSYC 150a, Social Psychology John Bargh

Study of social cognition, attitudes and persuasion, group processes, intergroup processes, prosocial behavior, aggression, and conformity. Theories, methodology, and applications of social psychology. Prerequisite: PSYC 110. SO
Psychology: Social Science
Psychology: Core

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
Psychology: Natural Science
Psychology: Core

PSYC 200b, Statistics Gregory Samanez-Larkin

Measures of central tendency, variability, association, and the application of probability concepts in determining the significance of research findings. QR

* **PSYC 270b, Research Methods in Behavioral Neuroscience** Nelson Donegan

Laboratory course in which students design and conduct research to study brain function and behavior. Emphasis on hands-on participation in behavioral and neuroscience techniques. Prerequisites: PSYC 160 or 170, and a course in statistics, or with permission of instructor. SC

Psychology: ResearchMethods

Psychology: Natural Science

* **PSYC 479b, 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, counterfactual reasoning, causal learning, inductive inferences, analogical reasoning, problem solving, critical thinking, and creativity. First class meeting to be held during course selection period at a time determined by admitted students. See the syllabus on Classes*v2 (<http://classesv2.yale.edu>) for application information. so

College Seminars

Residential college seminars for the fall and spring terms are described on the college seminar program's Web site (<http://yalecollege.yale.edu/academics/special-academic-programs/residential-college-seminar-program>). The online listings contain course titles, descriptions, and prerequisites. Course syllabi are available on Classes*v2 (<http://classesv2.yale.edu>).

Students apply to college seminars before classes begin through an online tool on the program's Web site (<http://yalecollege.yale.edu/academics/special-academic-programs/residential-college-seminar-program/application-information>) 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 one college seminar per term and may enroll in no more than four total during their time at Yale. Auditing is not permitted in college seminars.

Computer Science

Director of undergraduate studies: Zhong Shao, 314 AKW, 432-6828, zhong.shao@yale.edu [F]; James Aspnes, 401 AKW, 432-1232, james.aspnes@yale.edu [Sp]; cpsc.yale.edu

FACULTY OF THE DEPARTMENT OF COMPUTER SCIENCE

Professors Dana Angluin, James Aspnes, † Dirk Bergemann, † Ronald Coifman, Julie Dorsey, Stanley Eisenstat, Joan Feigenbaum (*Chair*), Michael Fischer, David Gelernter, † Mark Gerstein, Drew McDermott, Vladimir Rokhlin, Holly Rushmeier, Brian Scassellati, Martin Schultz (*Emeritus*), Zhong Shao, Avi Silberschatz, Daniel Spielman, Y. Richard Yang, Steven Zucker

Associate Professors Daniel Abadi, Mahesh Balakrishnan

Assistant Professors † Wenjun Hu, † Amin Karbasi, Eric Koskinen (*Visiting*), † Sahand Negahban, Ruzica Piskac, Mariana Raykova, † Frederick Shic, † Jakub Szefer

Senior Lecturer Stephen Slade

Lecturers Jason Hirschhorn, † Kyle Jensen, Donya Quick, Brad Rosen, Ewa Syta, Xiyin Tang, Katherine Tsui

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

The Department of Computer Science offers both B.S. and B.A. degree programs, as well as three combined majors in cooperation with other departments: Electrical Engineering and Computer Science (p. 273), Computer Science and Mathematics (p. 219), and Computer Science and Psychology (p. 220). 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 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. With the exception of 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 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 has significant readings and a paper, and satisfies the writing or the humanities and arts distributional requirement.
4. 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.
5. 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.
6. 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.)

7. 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 core courses: CPSC 201; CPSC 202 or MATH 244; CPSC 223, 323, 365, and 490. The B.S. degree program requires six additional intermediate or advanced courses in Computer Science, for a total of twelve; the B.A. degree program, four, for a total of ten. CPSC 480 and 490 may not be counted toward these electives. All courses in the major must be taken for a letter grade.

Students majoring in Computer Science are advised to complete CPSC 201 and 223 by the end of the sophomore year.

For students who already know how to program, typical B.S. programs starting in the freshman and sophomore years are:

Freshman	Sophomore	Junior	Senior
CPSC 201a	CPSC 202a	Two electives	CPSC 490a
	CPSC 323a		
CPSC 223b	CPSC 365b	Two electives	One elective
	One elective		

and

Sophomore	Junior	Senior
CPSC 201a	CPSC 323a	CPSC 490a
CPSC 202a	One elective	Two electives
CPSC 223b	CPSC 365b	Two electives
	Two electives	

For typical B.A. programs, two of the electives would be omitted.

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 director of undergraduate studies, 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 (p. 129) and in Engineering and Applied Science (p. 276).

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.

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 director of undergraduate studies, students may enroll in 490 more than once or before their senior year.

Schedule approval All Computer Science majors in the sophomore, junior, and senior years should have their programs approved by the director of undergraduate studies.

Combined B.S./M.S. degree program in Computer Science 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. Eligibility requirements are described under "Simultaneous Award of the Bachelor's and Master's Degrees" in Section K, Special Arrangements (p. 65), in the Academic Regulations. 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. In fulfilling these requirements, students must complete eight graduate courses from the approved list, up to two of which may, with the permission of the director of undergraduate studies 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.
3. At the end of their fifth term of enrollment students must have achieved at least three-fourths A or A- grades in all of their course credits directly relating to the major.

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, 323, 365

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)

Introductory Courses

* **CPSC 079b, Digital Photorealism** Julie Dorsey

Basic methods used to define shapes, materials, and lighting when creating computer-generated images. Mathematical models for shape, texture models, and lighting techniques. Principles are applied through the use of modeling/rendering/animation software. Proficiency in high school-level mathematics is assumed. No previous programming experience necessary. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. QR

CPSC 100a, Introduction to Computing and Programming Brian Scassellati

Introduction to the intellectual enterprises of computer science and to the art of programming, with attention to algorithmic thinking and efficient problem solving. Topics include abstraction, algorithms, data structures, encapsulation, resource management, security, software engineering, and Web development. Programming in the languages C, PHP, and JavaScript, as well as SQL, CSS, and HTML. Applications in biology, cryptography, finance, forensics, and gaming. Students view course lectures on line; class time focuses on discussion of course material. No previous programming experience required. Open to students of all levels and majors. QR

CPSC 112b, Introduction to Programming Y. Richard Yang

Development on the computer of programming skills, problem-solving methods, and selected applications. No previous experience with computers necessary. QR

CPSC 113b, Programming and Entrepreneurship Kyle Jensen

Techniques for advanced software development, management, and entrepreneurship that are used to build software start-up companies. Prerequisite: CPSC 100 or 112 or equivalent programming experience.

CPSC 134a / MUSI 372a, Programming Musical Applications Donya Quick

Topics in computer music, including musical representations for computing, automated music analysis and composition, interactive systems, and virtual instrument design. Use of domain-specific programming languages and libraries to explore how the principles of computer science can be applied to music to create new interfaces, instruments, and tools. Recommended preparation: the ability to read music or play an instrument. 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 184a or b, Intellectual Property in the Digital Age** Xiyin Tang

The evolving and oftentimes vexing intellectual property regime of the new digital age. Focus on copyright, fair use, remix culture, access to knowledge, technological innovations, the increasing relevance of trademarks in the new information society, the tension between creativity/creating and the intellectual property rules which either foster or inhibit it, and the new information culture of the digital age. Prerequisite: CPSC 183 or permission of instructor. HU, 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 Stephen Slade

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.

CPSC 201a or b, Introduction to Computer Science Stephen Slade

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

Math: Stat/Applied Math

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 223b, Data Structures and Programming Techniques Stanley Eisenstat

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 257b, Information Security in the Real World Ewa Syta

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 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.

MATH 244a / AMTH 244a, Discrete Mathematics Asaf Ferber

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: Algebra/Number Theory

Math: Stat/Applied Math

Intermediate Courses

CPSC 323a, Introduction to Systems Programming and Computer Organization

Stanley Eisenstat

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 365b, Design and Analysis of Algorithms Daniel Spielman

Paradigms for problem solving: divide and conquer, recursion, greedy algorithms, dynamic programming, randomized and probabilistic algorithms. Techniques for analyzing the efficiency of algorithms and designing efficient algorithms and data structures. Algorithms for graph theoretic problems, network flows, and numerical linear algebra. Provides algorithmic background essential to further study of computer science. After CPSC 202 and 223. QR

Math: Stat/Applied Math

Advanced Courses

CPSC 422a, Design and Implementation of Operating Systems Zhong Shao

The design and implementation of operating systems. Topics include synchronization, deadlock, process management, storage management, file systems, security, protection, and networking. 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.

CPSC 424b, Parallel Programming Techniques Andrew Sherman

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. After CPSC 223 and MATH 222 or 225, or equivalents. QR

[**CPSC 426, Building Decentralized Systems**]

CPSC 427b, Object-Oriented Programming Michael Fischer

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 430, Formal Semantics**]

CPSC 432b, Computer Music: Sound Representation and Synthesis Donya Quick

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 433b, Computer Networks Y. Richard 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 434, Mobile Computing and Wireless Networking]

[CPSC 435, Internet-Scale Applications]

[CPSC 436, Networked Embedded Systems and Sensor Networks]

CPSC 437a, Introduction to Databases 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 202 and 223. QR

CPSC 438b, Database System Implementation and Architectures Daniel Abadi

A study of systems programming techniques, with a focus on database systems. In the first half of the term, students analyze the design of a traditional DBMS and build components of a DBMS prototype, e.g., a catalog-manager, a buffer-manager, and a query execution engine. In the second half, students examine nontraditional architectures such as parallel databases, data warehouses, stream databases, and Web databases. After or concurrently with CPSC 202 and 323. QR

CPSC 439b, Software Engineering Ruzica Piskac

Introduction to fundamental concepts in software engineering and to the development and maintenance of large, robust software systems. The process of collecting requirements and writing specifications; project planning and system design; methods for increasing software reliability, including delta debugging and automatic test-case generation; type systems, static analysis, and model checking. Students build software in teams. After CPSC 323. QR RP

CPSC 440b, Numerical Computation Vladimir Rokhlin

Algorithms for numerical problems in the physical, biological, and social sciences: solution of linear and nonlinear systems of equations, interpolation and approximation of functions, numerical differentiation and integration, optimization. After CPSC 112 or an equivalent introductory programming course; MATH 120; and MATH 222 or 225 or CPSC 202. QR

Math: Stat/Applied Math

CPSC 445a, Introduction to Data Mining Vladimir Rokhlin

A study of algorithms and systems that allow computers to find patterns and regularities in databases, to perform prediction and forecasting, and to improve their performance generally through interaction with data. After CPSC 202, 223, and MATH 222, or equivalents. 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. QR, SC

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. RP

[**CPSC 455, Economics and Computation**]

* **CPSC 457b, Sensitive Information in a Connected World** Ewa Syta

Issues of ownership, control, privacy, and accuracy of the huge amount of sensitive information about people and organizations that is collected, stored, and used by today's ubiquitous information systems. Readings consist of research papers that explore both the power and the limitations of existing privacy-enhancing technologies such as encryption and "trusted platforms." After or concurrently with CPSC 365 and 467. QR

CPSC 458a, Automated Decision Systems Stephen Slade

The spectrum of automated decision models and tools, with a focus on their costs and effectiveness. Examples from a variety of fields, including finance, risk management, robotics, medicine, and politics. After CPSC 201 and 223 or equivalents. QR

[**CPSC 462, Graphs and Networks**]

CPSC 465b, Theory of Distributed Systems James Aspnes

Models of asynchronous distributed computing systems. Fundamental concepts of concurrency and synchronization, communication, reliability, topological and geometric constraints, time and space complexity, and distributed algorithms. After CPSC 323 and 365. QR

CPSC 467a, Cryptography and Computer Security Michael Fischer

A survey of such private and public key cryptographic techniques as DES, RSA, and zero-knowledge proofs, and their application to problems of maintaining privacy and security in computer networks. Focus on technology, with consideration of such societal issues as balancing individual privacy concerns against the needs of law enforcement, vulnerability of societal institutions to electronic attack, export regulations and international competitiveness, and development of secure information systems. Some programming may be required. After CPSC 202 and 223. QR

CPSC 468b, Computational Complexity Joan Feigenbaum

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 with permission of instructor. QR

[CPSC 469, Randomized Algorithms]**CPSC 470a, Artificial Intelligence** Drew McDermott

Introduction to artificial intelligence research, focusing on reasoning and perception. Topics include knowledge representation, predicate calculus, temporal reasoning, vision, robotics, planning, and learning. After CPSC 201 and 202. QR

[CPSC 471, Advanced Topics in Artificial Intelligence]**CPSC 472a, Intelligent Robotics** Katherine Tsui

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.

*** 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.

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. After CPSC 112 and MATH 120, or with permission of instructor. QR, SC RP

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 480b, Directed Reading** James Aspnes

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, Special Projects** 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 Mathematics

Directors of undergraduate studies: Zhong Shao (Computer Science), 314 AKW, 432-6828, zhong.shao@yale.edu [F]; James Aspnes (Computer Science), 401 AKW,

432-1232, james.aspnes@yale.edu [Sp]; Andrew Casson (Mathematics), 216 LOM, 432-7056, andrew.casson@yale.edu

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.

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; 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.

The senior requirement is a project or an essay on a topic acceptable to both departments. An oral report on the mathematical aspects of the project must be presented to the Mathematics faculty.

The entire program of each student majoring in Computer Science and Mathematics must be approved by the director of undergraduate studies in each department. Courses taken Credit/D/Fail may not be counted toward the major.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 14 term courses (not incl senior req)

Specific courses required CPSC 201, 223, 323, 365; 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; oral report to Math dept on mathematical aspects of project

Computer Science and Psychology

Directors of undergraduate studies: Zhong Shao (Computer Science), 314 AKW, 432-6828, zhong.shao@yale.edu [F]; James Aspnes (Computer Science), 401 AKW, 432-1232, james.aspnes@yale.edu [Sp]; Laurie Santos (Psychology), 213 SSS, 432-4524, laurie.santos@yale.edu [F]; Gregory Samanez-Larkin (Psychology), 318 SSS, 432-1150, gregory.samanez-larkin@yale.edu [Sp]

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.

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.

Eight of the fourteen courses must be in computer science: CPSC 201, 202, 223, 323, 365, and three advanced computer science courses in artificial intelligence (e.g., CPSC 470, 471, 473, or 475). 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 one course in cognitive psychology or cognitive science listed in Psychology. Courses in the range PSYC 490–499 may not be counted toward this requirement. For the Class of 2017 and subsequent classes, at least one of the two psychology courses from the social science point of view must be designated as Core in the course listings.

A second course in cognitive psychology or cognitive science 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.

Senior requirement Students must take either CPSC 490 or a course from the range PSYC 496–499, and the project must be approved by the director of undergraduate studies in each department.

Approval of program The entire program of each student majoring in Computer Science and Psychology must be approved by the director of undergraduate studies in each department. 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. For the Class of 2017 and subsequent classes, no 200-level course in Psychology taken Credit/D/Fail may be counted.

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, 365; PSYC 200

Distribution of courses 8 courses in Comp Sci, with 3 advanced AI courses; 6 courses in Psych, with at least 1 from PSYC 210–299 and at least 1 in cognitive psych or cognitive science listed in Psych; *Class of 2016 and previous classes*—at least 2 courses in Psych from social science point of view; *Class of 2017 and subsequent classes*—at least 2 courses in Psych from social science point of view, at least 1 designated Core

Substitution permitted For CPSC 202, MATH 244; for 1 course in AI, 1 addtl course in cognitive psych or cognitive science; for PSYC 200, 1 addtl course in Psych and exam arranged with instructor

Senior requirement CPSC 490 or a course from PSYC 496–499, with project approved by DUS in each dept

Computing and the Arts

Director of undergraduate studies: Julie Dorsey (Computer Science), 507 AKW, 432-4249, julie.dorsey@yale.edu

Computing and the Arts is an interdepartmental major designed for students who wish to integrate work in computing with work in one of the arts disciplines: 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; 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 CPSC 112, which should be taken during the freshman year. Additional prerequisites for the Art track are ART 111 and 114. There are no additional prerequisites for the History of Art track. An additional prerequisite for the Music track is MUSI 210, as determined by the music theory placement test. (Students who do not place into or out of MUSI 210 may need to take a lower-level course first.) 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.

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 art, history of art, music, or theater studies. (A track in architecture is expected to be added.) All requirements for a single track must be satisfied, as specified below.

The Art track requires the following courses in addition to the Computer Science courses listed above: (1) two 100-level courses beyond ART 111 and 114, such as ART 132, 138, or 145; (2) two courses in Art at the 200 or 300 level; (3) ART 395; (4) one course in Art at the 400 level; (5) two courses selected from CPSC 475, 478, and 479; (6) one additional intermediate or advanced Computer Science course (excluding CPSC 490).

The History of Art track requires the following courses in addition to the Computer Science courses listed above: (1) one introductory History of Art course: HSAR 112, 142, or 143; (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 325; (2) five term courses chosen from MUSI 312, 313, 343, 412, 413, 471, and 472; (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).

Senior requirement The senior project requires two terms: one term of CPAR 491, and one term of ART 495, HSAR 499, MUSI 490 or 491, or THST 471 or 491, depending on the track chosen. The project must be approved by the director of undergraduate studies and be acceptable to both departments. Students must submit a written report, including an electronic abstract and Web page(s).

Approval of program The entire program of each student majoring in Computing and the Arts must be approved by the director of undergraduate studies. Courses taken Credit/D/Fail may not be counted toward the major.

REQUIREMENTS OF THE MAJOR

Prerequisites *All tracks* – CPSC 112; *Art track* – ART 111, 114; *Music track* – MUSI 210; *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; *Art track* – ART 395, 2 from CPSC 475, 478, 479; *History of Art track* – 2 from CPSC 437, 475, 478, 479, including 1 of CPSC 478, 479; 1 from HSAR 112, 142, 143; HSAR 401; *Music track* – CPSC 431, 432; MUSI 325; *Theater Studies track* – CPSC 431 or 432; CPSC 478 or 479; THST 210

Distribution of courses *All tracks* – 6 courses in Comp Sci, incl 1 addtl intermediate or advanced course beyond specific reqs (excluding CPSC 490); *Art track* – 2 courses in Art at 100 level (excluding prereqs), 2 at 200 or 300 level, and 1 at 400 level (in addition to senior req); *History of Art track* – 2 courses in different areas of History of Art at 200, 300, or 400 level; one 400-level sem in History of Art; 1 studio art course; *Music track* – 5 courses from MUSI 312, 313, 343, 412, 413, 471, 472; *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 approved by DUS; *Art track* – Senior project completed in CPAR 491 and ART 495; *History of Art track* – Senior project completed in CPAR 491 and HSAR 499; *Music track* – Senior project completed in CPAR 491 and MUSI 490 or 491; *Theater Studies track* – Senior project completed in CPAR 491 and THST 471 or 491

Courses

* **CPAR 291a or b, Special Projects** Julie Dorsey

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** Julie Dorsey

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 197b / HLTH 140b / SOCY 126b, Health of the Public: Medicine and Disease in Social Context 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

Directed Studies

Director of undergraduate studies: Kathryn Slanski, Rm. 321, 53 Wall St., 432-6630, kathryn.slanski@yale.edu; chair of Humanities: Bryan Garsten, Rm. 212, 53 Wall St., 432-1313, bryan.garsten@yale.edu; directedstudies.yale.edu

Directed Studies, a selective program for freshmen, is an interdisciplinary introduction to a selection of seminal texts of Western civilization from ancient Greece to the twentieth century. A coherent program of study, Directed Studies encourages students to put rich and complex texts into conversation with one another across time and genres and to make connections across traditional disciplinary boundaries. Students in Directed Studies learn to analyze challenging and urgent texts, become valuable members of seminar discussions, and write clear and persuasive analytic essays.

The Directed Studies program consists of three integrated full-year courses in Literature, Philosophy, and Historical and Political Thought. One hundred twenty-five members of the freshman class are accepted each year. Students entering the program must enroll in all three courses and are expected to enroll for both terms.

Each of the three courses meets weekly for one lecture and two seminars. 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 a series of colloquia that feature distinguished speakers from within and without Yale. The study of written texts is enhanced by sessions at the Yale Art Gallery, the Yale Center for British Art, and the Beinecke Rare Book and Manuscript Library.

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.)

Directed Studies represents a significant commitment for the freshman year and consequently enables students to fulfill 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 DRST 005, 006, 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 DRST 001, 002, Literature, may be counted toward the Literature major. The program serves as a strong foundation for all majors in Yale College, including those in any 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: Edward Kamens, 310 HGS, 432-2862,
edward.kamens@yale.edu; call.yale.edu

FACULTY OF THE DEPARTMENT OF EAST ASIAN LANGUAGES AND LITERATURES

Professors Kang-i Sun Chang, Aaron Gerow, Edward Kamens, Tina Lu (*Chair*), Jing Tsu

Assistant Professors William Fleming, Michael Hunter, Seth Jacobowitz

Senior Lecturer Pauline Lin

Senior Lectors II Seungja Choi, Ling Mu

Senior Lectors Hsiu-hsien Chan, Min Chen, Koichi Hiroe, Angela Lee-Smith, Rongzhen Li, Ninghui Liang, Fan Liu, Yoshiko Maruyama, Michiaki Murata, Hiroyo Nishimura, Yu-lin Wang Saussy, Masahiko Seto, Jianhua Shen, Mari Stever, Wei Su, Haiwen Wang, Peisong Xu, William Zhou

Lectors Fuyang Peng, Aoi Saito, Chuanmei Sun

Affiliated Faculty Chloe Starr (*Divinity School*)

The major in East Asian Languages and Literatures provides an intellectually focused and rigorous immersion in the East Asian humanities. The department's courses reflect the breadth, depth, and variety of East Asian textual traditions, premodern through modern, including film and theater. The major is focused on the analysis of literature, culture, and thought, and is built on a solid foundation of language study. Students elect either the Chinese or the Japanese track, but are encouraged to take courses in both tracks and to become familiar with aspects of East Asian literary culture that transcend geographic parameters.

Course numbering Language courses use the subject codes CHNS, JAPN, or KREN. Courses with the subject code EALL are content courses whose focus is critical and humanistic; those numbered 200 to 299 are introductory, and those numbered 300 to 399 are advanced. Courses numbered EALL 001 to 099 are freshman seminars on East Asian literature, film, and humanities.

Courses for nonmajors All courses offered by the Department of East Asian Languages and Literatures are open to nonmajors.

Prerequisite Candidates for the major must complete CHNS 140 or JAPN 140 or the equivalent.

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.

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.

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.

Placement examination 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 departmental Web site (<http://eall.yale.edu/academics/language-programs>) in August. The Chinese and Japanese examinations have online components accessed through the same site. Students of Japanese, Chinese, and Korean returning from programs abroad must take a placement examination unless the course work was completed at an institution preapproved by the Richard U. Light Fellowship program. For questions, consult with the director of undergraduate studies.

Study abroad Students are encouraged to study abroad. Interested students should consult with the director of undergraduate studies and with the office of the Richard U. Light Fellowship (<http://www.yale.edu/icfp/light/overview.html>) 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 prereq

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)

East Asian Humanities

EALL 200a, The Chinese Tradition Tina Lu and Michael Hunter

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. No knowledge of Chinese required. HU

EALL 203b / LITR 197b, The Tale of Genji Edward Kamens

A reading of the central work of prose fiction in the Japanese classical tradition in its entirety (in English translation) along with some examples of predecessors, parodies, and adaptations (the latter include Noh plays and twentieth-century short stories). Topics of discussion include narrative form, poetics, gendered authorship and readership, and the processes and premises that have given *The Tale of Genji* its place in "world literature." Attention will also be given to the text's special relationship to visual culture. No knowledge of Japanese required. A previous college-level course in the study of literary texts is recommended but not required. HU

EALL 211a / 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 235a / EAST 465a, Writing and Textual Culture in China and Beyond** Staff
The development of writings and writing practices in China, with a focus on the period from 200 to 1000 A.D. Ways in which text-based activities have been regulated by and interacted with the material, social, intellectual, and ideological dimensions of an encompassing Chinese textual culture. The operation of such processes and their effects on the written language. WR, HU

* **EALL 271a / FILM 448a, Japanese Cinema after 1960** Aaron Gerow
The development of Japanese cinema after the breakdown of the studio system, through the revival of the late 1990s, and to the present. No knowledge of Japanese required. HU

* **EALL 280b / FILM 307b, East Asian Martial Arts Film** Aaron Gerow
An investigation of the martial arts films of East Asia (Japan, China, Hong Kong, Korea, Taiwan), including the samurai film, kung-fu and karate film, and wuxia film, and the roles they play in constructing nationalism and transnationalism, gender, stardom, spirituality, and mediality. HU

* **EALL 284a / EAST 463a / FILM 384a, North Korea through Film** Staff
Introduction to the cultural history of North Korea, with a focus on the politics, ethics, and aesthetics of visual representation. Styles and forms range from independent documentary to official propaganda to big-budget studio films. The fundamentals of film analysis; major texts on North Korea's society, history, and political system. HU

* **EALL 300b, 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 303a, Readings in Classical Chinese Poetry** Kang-i Sun Chang
Fundamentals of classical Chinese poetry and poetics. Readings vary from year to year; topics include poetry and history, intertextuality, and poetic reception. Readings in Chinese; discussion in English. Prerequisite: CHNS 171 or equivalent, or permission of instructor. Formerly CHNS 303. HU

- * **EALL 318b / HUMS 401b, Interpretations: The Dream of the Red Chamber** Tina Lu and R. Howard Bloch

Close reading of the eighteenth-century Chinese novel *The Dream of the Red Chamber* in translation, with some attention to secondary and theoretical materials. The novel is used to examine humanistic questions, including what it means to read across cultures. Priority to Humanities majors. HU

- * **EALL 351a, Advanced Readings in Modern Chinese Literature** Jing Tsu
An introduction to literary criticism and history using texts in the original language. Fiction and nonfiction written in Chinese in different parts of the world, with a focus on the period from the nineteenth century to the present. Readings in Chinese; texts in both simplified and traditional characters. After CHNS 163, 164, 165, or equivalent. HU

- * **EALL 470a and EALL 471b, Independent Tutorial** Staff
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** Edward Kamens
Preparation of a one-term senior essay under faculty supervision.

- * **EALL 492a and EALL 493b, Yearlong Senior Essay** Edward Kamens
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** Jianhua Shen, Yu-Lin Wang-Saussy, Min Chen, and Chuanmei Sun

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. Credit only on completion of CHNS 120. L1 RP 1½ Course cr

- * **CHNS 120a or b, Elementary Modern Chinese II** Jianhua Shen and Staff
Continuation of CHNS 110. After CHNS 110 or equivalent. L2 RP 1½ Course cr

- * **CHNS 130a or b, Intermediate Modern Chinese I** Ninghui Liang and Peisong Xu
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, Elementary Modern Chinese for Advanced Learners I** Fan Liu and Hsiu-hsien Chan

First level of the advanced learner sequence, intended for students with some aural proficiency but 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. L3 RP 1½ Course cr

* **CHNS 140b, Intermediate Modern Chinese II** Ninghui Liang and Peisong Xu
Continuation of CHNS 130. To be followed by CHNS 150. After CHNS 130 or equivalent. L4 RP 1½ Course cr

* **CHNS 142b, Elementary Modern Chinese for Advanced Learners II** Fan Liu and Hsiu-hsien Chan
Continuation of CHNS 132. After CHNS 132 or equivalent. L4 RP 1½ Course cr

* **CHNS 150a, Advanced Modern Chinese I** Rongzhen Li and Ling Mu
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 1½ Course cr

* **CHNS 151b, Advanced Modern Chinese II** Rongzhen Li and Ling Mu
Continuation of CHNS 150. After CHNS 150 or equivalent. L5 1½ Course cr

* **CHNS 152a and CHNS 153b, Intermediate Modern Chinese for Advanced Learners**
Haiwen Wang
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 142 or equivalent. L5 RP 1½ Course cr per term

* **CHNS 154a, Advanced Modern Chinese III** William Zhou
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, Advanced Modern Chinese IV** William Zhou
Continuation of CHNS 154. After CHNS 154 or equivalent. L5

* **CHNS 162a and CHNS 163b, Advanced Modern Chinese for Advanced Learners**
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 153 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 focus on speaking and writing skills. Issues in contemporary Chinese society explored through media forms such as newspapers, radio, television, and Internet blogs. After CHNS 155, 162, or equivalent. 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 RP

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 RP

CHNS 212b, 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

Japanese

* **JAPN 110a, Elementary Japanese I** Hiroyo Nishimura, Michiaki Murata, and Aoi Saito

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. Credit only on completion of JAPN 120. L1 RP 1½ Course cr

* **JAPN 120b, Elementary Japanese II** Hiroyo Nishimura, Michiaki Murata, and Aoi Saito

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** Yoshiko Maruyama, Masahiko Seto, and Mari Stever

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** Yoshiko Maruyama, Masahiko Seto, and Mari Stever

Continuation of JAPN 130. After JAPN 130 or equivalent. L4 RP 1½ Course cr

* **JAPN 150a, Advanced Japanese I** Mari Stever and Yoshiko Maruyama

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 1½ Course cr

* **JAPN 151b, Advanced Japanese II** Mari Stever and Yoshiko Maruyama

Continuation of JAPN 150. After JAPN 150 or equivalent. L5 RP 1½ Course cr

* **JAPN 156a, Advanced Japanese III** Koichi Hiroe and Hiroyo Nishimura

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 1½ Course cr

* **JAPN 157b, Advanced Japanese IV** Koichi Hiroe and Hiroyo Nishimura

Continuation of JAPN 156. After JAPN 156 or equivalent. L5 1½ Course cr

* **JAPN 162a, Reading Academic Japanese I** Masahiko Seto

Close reading of major writings from the Meiji era to the present, including newspaper articles, scholarly works, fiction, and prose. Students gain a command of academic Japanese through comprehensive study of grammar in the context of culture. Individual tutorial sessions provide speaking practice. After JAPN 157 or equivalent; recommended to be taken after or concurrently with JAPN 170. L5

* **JAPN 163b, Reading Academic Japanese II** Masahiko Seto

Continuation of JAPN 162. After JAPN 162 or equivalent; recommended to be taken after JAPN 170. L5

* **JAPN 164a and JAPN 165b, Academic and Professional Spoken Japanese** Koichi Hiroe

Advanced language course with a focus on the speaking skills necessary in academic and professional settings. Includes online interviews, discussions, and debates with native Japanese students and scholars on contemporary topics such as globalization, environment, technology, human rights, and cultural studies. Individual tutorial sessions provide speaking practice. After JAPN 163 or equivalent. L5

JAPN 170a, Introduction to Literary Japanese Edward Kamens

Introduction to the grammar and style of the premodern literary language (*bungotai*) through a variety of texts. After JAPN 151 or equivalent. L5

*** JAPN 171b, Readings in Literary Japanese** William Fleming

Close analytical reading of a selection of texts from the Nara through the Tokugawa periods: prose, poetry, and various genres. Introduction to *kanbun*. After JAPN 170 or equivalent. L5

Korean

*** KREN 110a, Elementary Korean I** Angela Lee-Smith

A beginning course in modern Korean. Pronunciation, lectures on grammar, conversation practice, and introduction to the writing system (*Hankul*). Credit only on completion of KREN 120. L1 RP 1½ Course cr

*** KREN 120b, Elementary Korean II** Seungja Choi

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** Angela Lee-Smith

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 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: Frances Rosenbluth, 308 RKZ, 432-5256,
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FACULTY ASSOCIATED WITH THE PROGRAM OF EAST ASIAN STUDIES

Professors Daniel Botsman (*History*), Kang-i Sun Chang (*East Asian Languages & Literatures*), Deborah Davis (*Sociology*), Aaron Gerow (*East Asian Languages & Literatures, Film & Media Studies*), Valerie Hansen (*History*), Edward Kamens (*East*

Asian Languages & Literatures), William Kelly (*Anthropology*), Tina Lu (*East Asian Languages & Literatures*), Peter Perdue (*History*), Frances Rosenbluth (*Political Science*), Helen Siu (*Anthropology*), William Summers (*History of Medicine*), Jing Tsu (*East Asian Languages & Literatures, Comparative Literature*), Anne Underhill (*Anthropology*), Mimi Yiengpruksawan (*History of Art*)

Associate Professors Fabian Drixler (*History*), William Honeychurch (*Anthropology*), Karen Nakamura (*Anthropology*), Andrew Quintman (*Religious Studies*), Chloe Starr (*Divinity School*)

Assistant Professors William Fleming (*East Asian Languages & Literatures, Theater Studies*), Eric Greene (*Religious Studies*), Michael Hunter (*East Asian Languages & Literatures*), Seth Jacobowitz (*East Asian Languages & Literatures*), Youn-mi Kim (*History of Art*), Eric Weese (*Economics*)

Senior Lecturers Annping Chin (*History*), Pauline Lin (*East Asian Languages & Literatures*)

Lecturers Kjell Ericson, Rebecca Fu, Woo Chang Kang, Dima Mironenko

Senior Lectors II Seungja Choi, Ling Mu

Senior Lectors Hsiu-hsien Chan, Min Chen, Koichi Hiroe, Angela Lee-Smith, Rongzhen Li, Ninghui Liang, Fan Liu, Yoshiko Maruyama, Michiaki Murata, Hiroyo Nishimura, Yu-lin Wang Saussy, Masahiko Seto, Jianhua Shen, Mari Stever, Wei Su, Haiwen Wang, Peisong Xu, William Zhou

Lectors Aoi Saito, Chuanmei Sun

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 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.

The prerequisite to the major is completion of study at the L2 level of an East Asian language taught at Yale. Beyond this 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 (see below). These courses are normally taken at Yale during the academic year, but with prior approval of the director of undergraduate studies 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 director of undergraduate studies.

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 program of East Asian Studies with a reading knowledge of the target language materials consulted for the essay.

Selection of courses Upon entering the major, students are expected to draw up an intellectually coherent sequence of courses in consultation with the director of undergraduate studies. They must consult with the director of undergraduate studies 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 East Asian Studies Council Web site (<http://ceas.yale.edu>).

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 director of undergraduate studies, and the director of graduate studies 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 "Simultaneous Award of the Bachelor's and Master's Degrees" in section K (p. 65) of the Academic Regulations. Interested students should consult the director of undergraduate studies 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

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 a senior thesis, or one-term senior essay in EAST 480, or one-credit, two-term senior research project in EAST 491, 492

* **EAST 030a / HIST 030a, Tokyo** Fabian Drixler

Four centuries of Japan's history explored through the many incarnations, destructions, and rebirths of its foremost city. Focus on the solutions found by Tokyo's residents to the material and social challenges of concentrating such a large population in one place. Tensions between continuity and impermanence, authenticity and modernity, and social order and the culture of play. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **EAST 032a / HIST 032a, Shanghai** Denise Ho

History of the city of Shanghai, with a focus on how Shanghai has been seen and what its experience reveals about modern China. Shanghai's unique place in imagining China; its transformation in the nineteenth century from a fishing village to an international "treaty port" and China's gateway to the West; twentieth-century Shanghai as a site of innovation, from politics and capitalism to media and fashion; the city's vilification in the early Mao years and later reemergence as a symbol of China's modernization. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, 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 309a / HIST 309Ja, 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 / 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

EAST 375b / HIST 375b, 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 454b / ECON 474b / GLBL 312b, Economic and Policy Lessons from Japan**

Stephen Roach

An evaluation of Japan's protracted economic problems and of their potential implications for other economies, including the United States, Europe, and China. Currency pressures, policy blunders, Abenomics, bubbles, and the global economic crisis of 2008; dangers to the global economy from a protracted postcrisis recovery period. Focus on policy remedies to avert similar problems in other countries.

Prerequisite: a course in macroeconomics. SO

* **EAST 462b / PLSC 397b, The Politics and Political Economy of East Asia** Frances

Rosenbluth and Woo Chang Kang

This class is designed to help students understand political, economic, and diplomatic developments in East Asia with a focus on Japan, China, Korea, and Taiwan. We begin with the historical events that shaped the internal politics of each country and their international relations. We will explore the inter-relationship between their politics and their paths of economic development. Finally, we consider their uneasy relationships as neighbors in East Asia. SO

* **EAST 463a / EALL 284a / FILM 384a, North Korea through Film** Staff

Introduction to the cultural history of North Korea, with a focus on the politics, ethics, and aesthetics of visual representation. Styles and forms range from independent documentary to official propaganda to big-budget studio films. The fundamentals of film analysis; major texts on North Korea's society, history, and political system. HU

* **EAST 464b / HIST 306Jb, Japan and the Ocean, 1600 to the Present** Staff

An ocean-centered history of Japan since c. 1600. Practices in the use of land and sea; how such practices have changed with political unification, political revolution, and the rise and fall of an empire. Topics include piracy, fisheries diplomacy, sushi, pollution, and nuclear power. WR, HU

* **EAST 465a / EALL 235a, Writing and Textual Culture in China and Beyond** Staff

The development of writings and writing practices in China, with a focus on the period from 200 to 1000 A.D. Ways in which text-based activities have been regulated by and interacted with the material, social, intellectual, and ideological dimensions of an encompassing Chinese textual culture. The operation of such processes and their effects on the written language. WR, HU

* **EAST 480a or b, One-Term Senior Essay** Frances Rosenbluth

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** Frances Rosenbluth

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

*** ANTH 397b / ARCG 397b, Archaeology of East Asia** Anne Underhill

Introduction to the findings and practice of archaeology in China, Japan, Korea, and southeast Asia. Methods used by archaeologists to interpret social organization, economic organization, and ritual life. Attention to major transformations such as the initial peopling of an area, establishment of farming villages, the development of cities, interregional interactions, and the nature of political authority. SO

Anthropology: Archaeology

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 RP

CHNS 212b, 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 200a, The Chinese Tradition Tina Lu and Michael Hunter

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. No knowledge of Chinese required. HU

EALL 203b / LITR 197b, The Tale of Genji Edward Kamens

A reading of the central work of prose fiction in the Japanese classical tradition in its entirety (in English translation) along with some examples of predecessors, parodies, and adaptations (the latter include Noh plays and twentieth-century short stories). Topics of discussion include narrative form, poetics, gendered authorship and readership, and the processes and premises that have given *The Tale of Genji* its place in "world literature." Attention will also be given to the text's special relationship to visual culture. No knowledge of Japanese required. A previous college-level course in the study of literary texts is recommended but not required. HU

EALL 211a / 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 303a, Readings in Classical Chinese Poetry** Kang-i Sun Chang

Fundamentals of classical Chinese poetry and poetics. Readings vary from year to year; topics include poetry and history, intertextuality, and poetic reception. Readings in Chinese; discussion in English. Prerequisite: CHNS 171 or equivalent, or permission of instructor. Formerly CHNS 303. HU

* **HIST 308Ja, History and Politics in Early China** Annping Chin

How the history and politics of early China came to shape political thinking and policy debates in two thousand years of imperial rule. WR, HU

HIST 373b, The Silk Road Valerie Hansen

A journey along the overland and sea routes that connected China, India, and Iran from 200 to 1000 C.E. and served as conduits for cultural exchange. The lives of merchants, envoys, pilgrims, and travelers interacting in cosmopolitan communities. Exploration of long-known and newly discovered archaeological ruins, along with primary sources in translation. HU

* **HIST 379Ja / HSHM 447a, History of Chinese Science** William Summers

Major themes in Chinese scientific thinking from antiquity to the twentieth century. Non-Western concepts of nature and the development of science in China; East-West scientific exchanges; and China's role in modern science. WR, HU RP

HSAR 142a / RLST 187a / SAST 265a, Introduction to the History of Art: The Classical Buddhist World Youn-mi Kim

Buddhist art and architecture of India, Pakistan, Afghanistan, and central Asia from earliest beginnings to the tenth century, and including Greco-Roman, Persian, and Islamic contact. HU

HSAR 351b, Chinese Landscape Painting Youn-mi Kim

Historical overview of Chinese landscape painting from the fourth to the twentieth century, with an emphasis on stylistic development. Painting theory and aesthetics; social discourse related to landscape painting in premodern Chinese intellectual history; the Chinese response to Western art in modern times. Examination of paintings from the Yale University Art Gallery. HU

HSAR 357a or b, Art and Architecture of Japan Mimi Yiengpruksawan

Survey of Japanese art and architecture from earliest times through the early nineteenth century. Introduction to paradigmatic monuments, with a focus on programmatic multimedia ensembles as found at Buddhist temples, Shinto shrines, Zen monastic enclaves, military installations and castles, vernacular living spaces, and public institutions of governance. HU

* **HSAR 453a, Textiles of Asia, 800–1800 C.E.** Ruth Barnes

Survey of the great textile traditions of China, India, and the Islamic world from the ninth through eighteenth centuries C.E. The roles of central and southeast Asia in the transmission of styles and techniques. The cultural meaning, mobility, and cross-cultural significance of textiles in Asia. Extensive use of the Yale University Art Gallery's textile collections. HU

* **HSAR 483a, Chinese Funerary Art** Youn-mi Kim

Examination of major Chinese tomb sites from the third century B.C.E. to the thirteenth century C.E., including the famous terracotta army of the First Emperor.

Traces of religious rituals and of beliefs about the afterlife in funerary artworks; the relations among visual art, religious views, and social values. HU

JAPN 170a, Introduction to Literary Japanese Edward Kamens

Introduction to the grammar and style of the premodern literary language (*bungotai*) through a variety of texts. After JAPN 151 or equivalent. L5

* **JAPN 171b, Readings in Literary Japanese** William Fleming

Close analytical reading of a selection of texts from the Nara through the Tokugawa periods: prose, poetry, and various genres. Introduction to *kanbun*. After JAPN 170 or equivalent. L5

RLST 134a, Buddhism in China and Japan Staff

Introduction to Buddhism in East Asia through a close reading of original sources in translation. Focus on the lives and teachings of several leading monks. Topics include meditation, faith, rebirth, and secret rituals. HU

MODERN PERIOD

ANTH 170b, Chinese Culture, Society, and History Helen Siu

Anthropological explorations of basic institutions in traditional and contemporary Chinese society. Topics include kinship and marriage, religion and ritual, economy and social stratification, state culture, socialist revolution, and market reform. SO
Anthropology: Sociocultural

* **ANTH 234b / WGSS 234b, Disability and Culture** Karen Nakamura

Exploration of disability from a cross-cultural perspective, using examples from around the globe. Disability as it relates to identity, culture, law, and politics. Case studies may include deafness in Japan, wheelchair mobility in the United States, and mental illness in the former Soviet republics. SO RP
Anthropology: Sociocultural

ANTH 254a, Japan: Culture, Society, Modernity William Kelly

Introduction to Japanese society and culture. The historical development of Japanese society; family, work, and education in contemporary Japan; Japanese aesthetics; and psychological, sociological, and cultural interpretations of Japanese behavior. WR, SO
Anthropology: Sociocultural

* **ANTH 355b / AFST 355b, China-Africa Encounters** Helen Siu

The history, effects, and implications of Chinese involvement in and with African countries over the past century. Diasporic experiences, with attention to informal economies, cultural strategies, and ethnic and religious tensions; land, finance, and infrastructure; Chinese aid and development in Africa since the late 1960s, including medical aid and charitable groups. SO

* **ANTH 414a, Hubs, Mobilities, and World Cities** Helen Siu

Analysis of urban life in historical and contemporary societies. Topics include capitalist and postmodern transformations; class, gender, ethnicity, and migration; and global landscapes of power and citizenship. SO RP

* **EALL 271a / FILM 448a, Japanese Cinema after 1960** Aaron Gerow

The development of Japanese cinema after the breakdown of the studio system, through the revival of the late 1990s, and to the present. No knowledge of Japanese required. HU

* **EALL 280b / FILM 307b, East Asian Martial Arts Film** Aaron Gerow

An investigation of the martial arts films of East Asia (Japan, China, Hong Kong, Korea, Taiwan), including the samurai film, kung-fu and karate film, and wuxia film, and the roles they play in constructing nationalism and transnationalism, gender, stardom, spirituality, and mediality. HU

* **EALL 300b, 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 351a, Advanced Readings in Modern Chinese Literature** Jing Tsu

An introduction to literary criticism and history using texts in the original language. Fiction and nonfiction written in Chinese in different parts of the world, with a focus on the period from the nineteenth century to the present. Readings in Chinese; texts in both simplified and traditional characters. After CHNS 163, 164, 165, or equivalent. HU

HIST 366a, History of Cities in Modern Asia Peter Perdue and Mark Baker

The history of Asian cities, with emphasis on long-term processes of urbanization and the daily life of hundreds of millions of people. Focus on China, now home to six of the world's thirty largest cities. Includes discussion of Japan, India, and related areas as well. HU

* **HSAR 475b, Chinese Painting in the Seventeenth Century** David Sensabaugh

Chinese painting from the masters of the late Ming period to the individualist and orthodox masters of the early Qing dynasty. Issues of art based on either art or nature. Attention to paintings from the period in the Yale University Art Gallery collection. HU

Ecology and Evolutionary Biology

Director of undergraduate studies: Marta Martínez Wells, 103 OML, 432-6294
marta.wells@yale.edu; eeb.yale.edu

FACULTY OF THE DEPARTMENT OF ECOLOGY AND EVOLUTIONARY BIOLOGY

Professors Leo Buss, † Nicholas Christakis, † Peter Crane, Michael Donoghue, † Vivian Irish, † Kenneth Kidd, David Post, Jeffrey Powell, Richard Prum, † Eric Sargis, † Oswald Schmitz, † David Skelly, Stephen Stearns, Paul Turner (*Chair*), † J. Rimas Vaišnys, Günter Wagner

Associate Professors † Alison Galvani, Walter Jetz, Thomas Near, † Jeffrey Townsend, David Vasseur

Assistant Professors † Forrest Crawford, Carla Staver

Senior Lecturer Marta Martínez Wells

Lecturers Gisella Caccone, Mary Beth Decker, Linda Puth

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

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, or insects.

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 chemistry, or CHEM 118, taken with their associated laboratories, and one term of organic chemistry with laboratory. CHEM 124, 125, or CHEM 174, 175, taken with CHEM 222L, 223L, satisfies both chemistry requirements. Two terms of physics are required, PHYS 170, 171 or higher, and one term of mathematics, MATH 115 or higher or STAT 101–106. A different statistics course approved by the director of undergraduate studies may be substituted for the mathematics prerequisite.

Acceleration credit awarded in chemistry, mathematics, and physics, or completion of advanced courses in those departments, is 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 STAT 101–106) and/or additional mathematics courses such as MATH 120, 121, 222, or 225. Because chemistry courses are prerequisite to several EEB courses, students are strongly urged to take general and organic chemistry in the freshman and sophomore years. Students who place out of general chemistry should take organic chemistry

during their freshman year. Finishing the prerequisites early allows for a more flexible program in later years.

Placement 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. For information about the placement examination, refer to the *Calendar for the Opening Days of College* and the Freshman Web site (<http://yalecollege.yale.edu/new-students/class-2019/academic-information/special-programs-placement-and-preregistration/biology>).

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. The Chemistry department arranges placement in chemistry courses.

Requirements of the major 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, 291L, BENG 350, and MCDB 300.

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 Medical School. Courses from other departments may qualify with permission of the director of undergraduate studies.

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. The 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 director of undergraduate studies. College seminars may not be counted toward the requirements of the major.

Senior requirement 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 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 essay adviser before the end of the course selection period. Essays must be submitted to the director of undergraduate studies by the last day of classes.

Students in the B.S. degree program fulfill the senior requirement by completing one term of original research in E&EB 475, 495, or 496. Additional research courses may be taken as electives in E&EB 474 and may be taken before the senior year.

Credit/D/Fail No course taken Credit/D/Fail may be counted toward the EEB major, including prerequisites.

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 Course Credits and Course Loads (p. 44) in the Academic Regulations.

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's online bulletin (<http://www.yale.edu/printer/bulletin/htmlfiles/grad>), and many are posted on the Biological and Biomedical Sciences Web site (<http://bbs.yale.edu>). Additional information is available from the director of undergraduate studies 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.

Advising Freshmen considering a major in Ecology and Evolutionary Biology are invited to consult with the director of undergraduate studies. After the freshman 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 departmental Web site (<http://eeb.yale.edu>). 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 director of undergraduate studies is not required. Students whose regular adviser is on leave can consult the director of undergraduate studies to arrange for an alternate.

Study abroad Participation in study abroad field programs is encouraged. Credit for such programs may apply toward the major; interested students should consult the director of undergraduate studies prior to going abroad.

REQUIREMENTS OF THE MAJOR

Prerequisites BIOL 101, 102, 103, 104; 2-term chem lecture sequence or CHEM 118, with labs; 1 term of organic chem with lab CHEM 174, 175 (or CHEM 124, 125) with 222L, 223L satisfies both chem requirements); PHYS 170, 171 or higher; MATH 115 or higher or STAT 101–106

Number of courses *B.A.* – 3½ course credits (not incl senior req); *B.S.* – 5½ course credits (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, 291L, BENG 350, MCDB 300

Distribution of courses *B.S.* – 2 electives

Substitutions permitted Other stat course approved by DUS for math or stat prereq; two upper-level courses in G&G, Math, Comp Sci, or E&AS for organic chem and lab, with DUS permission; the second term of organic chem and lab and two physics labs for electives, with DUS permission

Senior requirement *B.A.* – E&EB 470 or senior essay; *B.S.* – E&EB 475, 495, or 496

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 and Lyme disease. Modes of transmission and establishment of infection; immune responses and the associated challenges to prevention and treatment. Intended for non-science majors. Prerequisite: high school biology. SC

E&EB 115a / F&ES 315a, Conservation Biology Linda Puth and Jeffrey Powell
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
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 symbols; plants in the environment. Includes visits to the Peabody Museum, the Marsh Botanical Garden, and the Yale Art Gallery. SC

E&EB 246a, Plant Diversity and Evolution Michael Donoghue
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 Staff
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). 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 272b, Ornithology** Richard Prum
An overview of avian biology and evolution, including the structure, function, behavior, and diversity of birds. The evolutionary origin of birds, avian phylogeny, anatomy,

physiology, neurobiology, breeding systems, and biogeography. Enrollment limited to 50. SC

* **E&EB 273Lb, Laboratory for Ornithology** Richard Prum

Laboratory and field studies of avian morphology, diversity, phylogeny, classification, identification, and behavior. Enrollment limited to 12. SC ½ Course cr

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 Ann Staver and David Vasseur

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 Thomas Near and 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

Psychology: AdvSci NeuroTrk

* **E&EB 230a / EVST 221a / F&ES 221a, Field Ecology** Linda Puth

A field-based introduction to ecological research, using experimental and descriptive approaches, comparative analysis, and modeling for field and small-group projects. Weekly field trips explore local lake, salt marsh, rocky intertidal, traprock ridge, and upland forest ecosystems. Includes one Saturday field trip and a three-day trip during the October recess. Concurrently with or after E&EB 220 or with permission of instructor. SC

* **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 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 Anatomy of Vertebrates Günter Wagner

A survey of the structure, variation, and evolution of major vertebrate groups. Topics include the microanatomy of major organ systems, the embryology of the vertebrate body plan, and the 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** Günter Wagner
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 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 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. 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 460b / HLTH 480b, Studies in Evolutionary Medicine I** Stephen Stearns

Principles of evolutionary biology applied to issues in medical research and practice. Lactose and alcohol tolerance; the "hygiene hypothesis"; genetic variation in drug response and pathogen resistance; spontaneous abortions, immune genes, and mate choice; the evolution of aging; the ecology and evolution of disease; the emergence of new diseases. Students develop proposals for research to be conducted during the summer. Admission by competitive application; forms are available on the EEB Web site (<http://www.eeb.yale.edu>). SC

* **E&EB 461a / HLTH 481a, Studies in Evolutionary Medicine II** Paul Turner

Continuation of E&EB 460. Prerequisite: E&EB 460 or permission of instructor. SC

* **E&EB 469a or b, Tutorial** Staff

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** Staff

Tutorial for seniors in the B.A. degree program who elect a term of independent study to complete the senior requirement. 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. 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** Staff

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 Classes server, 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 of the director of of undergraduate studies by the last day of reading period in the term of enrollment.

*** E&EB 475a or b, Senior Research** Staff

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 Classes server, 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. Enrollment limited to seniors. Fulfills the senior requirement for the B.S. degree.

*** E&EB 495a and E&EB 496b, Intensive Senior Research** Staff

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: Samuel Kortum, Rm. 305, 28 Hillhouse Ave., 432-6217 or 432-3574, qazi.azam@yale.edu; economics.yale.edu/undergraduate-program

FACULTY OF THE DEPARTMENT OF ECONOMICS

Professors Joseph Altonji, Donald Andrews, Dirk Bergemann, Steven Berry, Truman Bewley, Xiaohong Chen, Ray Fair, John Geanakoplos, Pinelopi Goldberg, Timothy Guinnane, Philip Haile, Johannes Horner, Gerald Jaynes, Dean Karlan, Yuichi Kitamura, Alvin Klevorick, Samuel Kortum, Naomi Lamoreaux, Giovanni Maggi, Konstantinos Meghir, Giuseppe Moscarini, William Nordhaus, Peter Phillips, Benjamin Polak, Mark Rosenzweig, Larry Samuelson, Robert Shiller, Anthony Smith, Aleh Tsyvinski, Christopher Udry, Edward Vytlačil, Ebonya Washington

Associate Professors Costas Arkolakis, Eduardo Faingold, Amanda Kowalski, Nancy Qian

Assistant Professors Timothy Armstrong, Jose-Antonio Espin-Sanchez, Mitsuru Igami, Daniel Keniston, Ilse Lindenlaub, Michael Peters, Nicholas Ryan, Joseph Shapiro, Eric Weese

Senior Lecturers Cheryl Doss, Tolga Koker, Douglas McKee

Lecturers Irasema Alonso, Michael Boozer, Katerina Simons

Economics concerns the wealth of nations, its origins in production and exchange, its allocation among competing uses, its distribution among individuals, and its accumulation or decline. Economics at Yale is regarded and taught as part of a liberal education, not as a preparation for any particular vocation. Nonetheless, economics provides an especially relevant background for a number of professions.

Requirements of the major Students majoring in Economics are required to take twelve term courses. Two of these may be introductory economics courses, one in microeconomics and one in macroeconomics. All majors must take the following courses: one term of intermediate microeconomics (ECON 121 or 125); one term of intermediate macroeconomics (ECON 122 or 126); one term of econometrics (ECON 131, 132, or 136); and one Yale mathematics course, usually selected from MATH 112, 115, 118, or 120. Students who place out of these mathematics courses must take a higher-level mathematics course at Yale and should consult the director of undergraduate studies in Economics. All of these 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, students may count toward the major one course related to economics but taught in another field, in addition to the required course in mathematics.

Students who take a term abroad or take summer courses not at Yale may petition the director of undergraduate studies 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 director of undergraduate studies before taking such courses. Courses taken outside Yale may not be counted toward the major requirements in intermediate microeconomics, intermediate macroeconomics, or econometrics.

Courses taken Credit/D/Fail and residential college seminars may not be counted toward the requirements of the major.

Introductory courses Introductory courses serve students considering a major in Economics as well as others who seek an introduction to the subject. Most students enroll in ECON 115 and 116, lecture courses with a discussion section. 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; it has a microeconomics prerequisite.

ECON 110 and 111 are limited-enrollment alternatives to ECON 115 and 116; they are open only to freshmen selected from those who preregister. ECON 108 also covers microeconomics, but with a greater emphasis on quantitative methods and examples. It is intended for, but not restricted to, freshmen with little or no experience with calculus. Enrollment is limited, and preregistration is required. ECON 108, 110, and 115 are similar in substance, and 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 introductory economics in the freshman year. In order to make the introductory courses available to all freshmen and to students majoring in other subjects, the introductory courses do not have a mathematics requirement.

Placement and exemptions for introductory courses Students with a score of 5 on the Advanced Placement tests for microeconomics and macroeconomics *and* a score of 5 on the Advanced Placement Calculus BC test may petition the director of undergraduate studies to place out of introductory microeconomics and introductory macroeconomics and enroll directly in intermediate microeconomics. It is recommended that students with a score of 5 on the Advanced Placement economics tests but without a 5 on the Calculus BC test take a Yale mathematics course such as MATH 115 or 120 and then petition the director of undergraduate studies to place out of introductory microeconomics and take intermediate microeconomics in the following term. Students with high scores on examinations equivalent to Advanced Placement, such as the GCE A-level or Higher Level International Baccalaureate, may also petition to be exempted from the introductory courses. For other placement and exemption questions, consult the departmental Web site (<http://economics.yale.edu/undergraduate-program>).

Mathematics Students are advised to meet the mathematics requirement for the major during their freshman year. The department also recommends that majors either complete MATH 118 or complete two term courses including MATH 120 and either 222 or 225. The latter two-term sequence is preferable for students who wish to take further mathematics courses or who plan to pursue a graduate degree in economics.

Econometrics Students are advised to take a two-term sequence of statistics and econometrics courses, especially if they are considering writing a senior essay. One option is to take ECON 131 followed by 132. Students with a stronger mathematics background or who plan to pursue a graduate degree in economics are encouraged to take either ECON 135 or STAT 241 and 242, followed by ECON 136. Prospective majors are urged to start their econometrics sequence in the fall of sophomore year.

Intermediate microeconomics and macroeconomics Along with econometrics, intermediate microeconomics and macroeconomics form the core of the major. Two 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; and economic history. Some advanced field courses have 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, numbered ECON 400–439, 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 numbered ECON 440–489), 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 course work.

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 departmental Web site (<http://economics.yale.edu/undergraduate-program>) for instructions. Students must take two of three core courses in intermediate microeconomics, intermediate macroeconomics, and econometrics before enrolling in a seminar. Underclassmen in the major and nonmajors may also enroll in Economics seminars and advanced lecture courses as space permits, but they do not preregister.

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 Yale Economics courses; courses in other departments or taken elsewhere do not suffice.

Senior essay Only those majors who submit a senior essay are eligible for Distinction in the Major. There are three types of senior essay: (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 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 492); or (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, with the option of completing the essay 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 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.

Meetings for seniors to discuss the senior essay will be held on Wednesday, September 2, at 4:30 p.m. and Thursday, September 3, at 1:30 p.m. in Room 106, 28 Hillhouse Avenue. Details regarding calculations for Distinction in the Major will be discussed in these meetings, and senior essay guidelines will be distributed. Senior essay prospectus forms are due Monday, October 5, 2015.

Distinction in the Major To be considered for Distinction, students must meet the appropriate grade standards as described in this bulletin under Honors (p. 31) and submit a senior essay to the Economics department. Students who fail to submit

an essay will not be considered for Distinction in the Major. Grade computation for Distinction does not include the introductory economics courses, the required mathematics course, or courses taken outside Yale.

Graduate courses Well-qualified students who have acquired the requisite background in undergraduate courses may, with written permission of the instructor, the director of undergraduate studies, and the director of graduate studies, be admitted to graduate courses and seminars. Descriptions of courses are available in the Economics department office.

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 and linear algebra. Students are urged to discuss their plans for graduate work with the director of undergraduate studies as early in their college careers as possible.

Faculty representatives The Economics department has faculty representatives associated with each residential college. Students majoring in Economics should secure written approval of their course selection from one of their college representatives. Changes in their major program must be approved by a representative. Questions concerning the major or programs of study should be directed to a college representative. For 2015–2016 the college representatives are as follows:

BK	T. Guinnane, E. Weese	MC	J. Altonji, A. Smith
BR	K. Meghir, J. Shapiro	PC	D. Bergemann, M. Peters
CC	M. Igami, W. Nordhaus	SY	T. Bewley, J. Espin-Sanchez
DC	D. Keniston, C. Udry	SM	C. Arkolakis, G. Moscarini
TD	N. Lamoaux, N. Ryan	ES	J. Geanakoplos, P. Haile
JE	R. Fair, P. Goldberg	TC	L. Samuelson, A. Tsyvinski

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 12 term courses (incl senior req)

Distribution of courses 1 intro course in microeconomics, 1 in macroeconomics (or equivalents with DUS permission); 1 math course, as specified

Specific courses required ECON 121 or 125; ECON 122 or 126; ECON 131, 132, or 136

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

Introductory Courses

* **ECON 108a or b, Quantitative Foundations of Microeconomics** Staff

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, An Introduction to Microeconomic Analysis** Staff

Similar to ECON 115, but taught as a lecture discussion with limited enrollment. Enrollment limited to freshmen. Online preregistration is required; visit: <http://economics.yale.edu/undergraduate-program> for more information. May not be taken after ECON 108 or 115. QR, SO

*** ECON 111b, An Introduction to Macroeconomic Analysis** Staff

Similar to ECON 116, but taught as a lecture discussion with limited enrollment. Enrollment limited to freshmen. 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

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 Eduardo Faingold

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

Econometrics and Statistics Courses

ECON 131a or b, Econometrics and Data Analysis I Staff

Basic probability theory and statistics, distribution theory, estimation and inference, bivariate regression, introduction to multivariate regression, introduction to statistical computing. After introductory microeconomics and MATH 112 or equivalent. QR, SO

ECON 132a or b, Econometrics and Data Analysis II Staff

Continuation of ECON 131, with a focus on multivariate regression. Topics include statistical inference, choice of functional form, heteroskedasticity, serial correlation, two-stage least squares, qualitative choice models, time series models, and forecasting. Emphasis on statistical computing and the mechanics of how to conduct and present empirical research. After two terms of introductory economics, completion of the mathematics requirement for the major, and ECON 131 or 135 or a course in the STAT 101–106 series. 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. After introductory microeconomics and either (1) MATH 118; or (2) MATH 120 and either MATH 222 or 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. After ECON 135 or STAT 241 and 242. QR, SO

Field Courses

ECON 159b, Game Theory Barry Nalebuff

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 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 / GBLB 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 185a / GBLB 237a, Debates in Macroeconomics Stephen Roach and Aleh Tsyvinski

Introduction to current theoretical and practical debates in macroeconomics. In-class debates between the instructors on topics such as economic crises, fiscal and monetary policy, inflation, debt, and financial regulations. Prerequisites: introductory microeconomics and macroeconomics. SO

ECON 187a, European Economic History, 1815–1945 Timothy Guinnane

European economic growth and development from the industrialization of Germany and other Continental countries in the early nineteenth century through World War II. The role of institutional development, the role of trade and imperialism, agricultural improvements, and industrialization. After two terms of introductory economics. SO

ECON 251a, Financial Theory John Geanakoplos

Capital asset pricing model, arbitrage pricing theory, option pricing, social security, operation of security exchanges, investment banks, securitization, mortgage derivatives, interest rate derivatives, hedge funds, financial crises, agency theory, and financial incentives. 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 255b, Introduction to Corporate Finance Jose-Antonio Espin-Sanchez

Introduction to the concepts and techniques necessary to analyze and implement optimal investment decisions. Prerequisite: introductory microeconomics. SO

ECON 275b / PLSC 218b, Public Economics Ebonya Washington

The role of government in the economy and in our economic lives. Reasons for government intervention in the market economy and the impact of government expenditure programs and taxation systems on welfare and behavior. Tools of microeconomics applied to issues such as government response to global warming, the impact of redistribution and social insurance on individual behavior, school choice, social security vs. private retirement savings accounts, and government vs. private health insurance. After introductory microeconomics. SO

ECON 325a, Economics of Developing Countries Nancy Qian

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. After introductory microeconomics and econometrics. SO

ECON 327b, The Economics of Poverty Alleviation Dean Karlan

Measures that succeed and fail—and why—in the fight against poverty in developing countries. Fundamentals of behavioral economics and their application to policy and program design. When and how to use experimental methods to evaluate ideas and programs. Interventions and policies that apply to households, small firms, and communities, with particular attention to microfinance, health, and education. After introductory microeconomics and econometrics. WR, SO

ECON 330b / EVST 340b, Economics of Natural Resources Robert Mendelsohn

Microeconomic theory brought to bear on current issues in natural resource policy. Topics include regulation of pollution, hazardous waste management, depletion of the world's forests and fisheries, wilderness and wildlife preservation, and energy planning. After introductory microeconomics. QR, SO

ECON 338a / EAST 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

ECON 339a, 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 Truman Bewley

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 Johannes Horner

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 371b, 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 131 and 132, or ECON 135 and 136. SO

Advanced Lecture Courses

Senior Economics majors may preregister for advanced lecture courses; see the departmental Web site (<http://economics.yale.edu/undergraduate-program>) for instructions. Other interested students may enroll with permission of the instructor during the course selection period.

*** ECON 407b / GLBL 310b, International Finance** Konstantinos Arkolakis

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 409b, Firms, Markets, and Competition Philip Haile

Analysis of imperfectly competitive markets, focusing on the interactions among firm behavior, market structure, and market outcomes. Topics include oligopoly, collusion, predation, firm entry, advertising, and price discrimination as well as public policy implications of market behavior. After intermediate microeconomics or equivalent.

QR, SO

*** ECON 410b, The Economics of Innovation** Mitsuru Igami

Study of forces that drive the process of innovation. Creativity and creative destruction; the innovator's dilemma; incentives to innovate; competitive advantage; industry evolution; intellectual property. Use of both formal theoretical models and quantitative empirical studies, as well as descriptive studies from management strategy and economic history. Prerequisites: econometrics and intermediate microeconomics.

*** ECON 412a, International Environmental Economics** Joseph Shapiro

Introduction to international and environmental economics and to research that combines the two fields. Methods for designing and analyzing environmental policy when economic activity and pollution cross political borders. Effects of market openness on the environment and on environmental regulation; international economics and climate change. Prerequisites: intermediate microeconomics and econometrics. SO

*** ECON 413b / AMTH 437b / EENG 437b, 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

Seminars

Senior Economics majors may preregister for departmental seminars; see the departmental Web site (<http://economics.yale.edu/undergraduate-program>) for instructions. Other interested students may enroll with permission of the instructor during the course selection period.

* **ECON 450a, Investment Analysis** 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 452b / EP&E 300b / GBLB 302b, Contemporary Issues in Energy Policy**

Ioannis Kessides

Overview of challenges in the global energy framework generated by concerns about energy security and climate change; public policies necessary for addressing these issues. Potential contributions and limitations of existing, improved or transitional, and advanced technologies. 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. Prerequisites: intermediate microeconomics and econometrics. SO

* **ECON 457b / EP&E 221b, Economics, Politics, and History: Institutional Design and Institutional Change** Jose-Antonio Espin-Sanchez

The efficiency and distributive consequences of institutions' governing of human relationships. Efficiency concerns with the size of the "pie"; ways in which different institutions generate a bigger "pie" than others. Distribution concerns with who gets a bigger piece of the "pie." Why "bad" institutions persist over time; what can be done to change from bad/old institutions to good/new institutions. Prerequisites: intermediate micro- or macroeconomics, and a course in statistics and probability. SO

* **ECON 461b, Economics, Addiction, and Public Policy** Jody Sindelar

Smoking, alcoholism, illicit drugs, and obesity studied from economic and policy perspectives. Focus on causes of and solutions to problems. After introductory microeconomics. SO

* **ECON 462b / EP&E 228b / GBLB 316b / LAST 410b, The Economics of Human Capital in Latin America** Douglas McKee

Economic issues related to a population's education, skills, and health; focus on contemporary Latin American societies. Determinants of health and education; evaluation of human capital development policies; the role of human capital in a variety of economic contexts, including the labor market, immigration, child investment, intrahousehold bargaining, inequality, and poverty. Prerequisites: intermediate microeconomics and econometrics. SO

* **ECON 464a / AFST 464a, The Economics of Africa** Cheryl Doss

Study of key microeconomic issues facing African economies and of the economic tools used to analyze such issues. Topics include infrastructure, land, agriculture, conflict, intrahousehold issues, health and education, microfinance and risk, and coping strategies. Readings from recent literature in microeconomic development. Prerequisites: intermediate microeconomics and econometrics. SO

* **ECON 465a / EP&E 224a / GBLB 330a, Debating Globalization** Ernesto Zedillo

Facets of contemporary economic globalization, including trade, investment, and migration. Challenges and threats of globalization: inclusion and inequality, emerging global players, global governance, climate change, and nuclear weapons proliferation.

Prerequisite: background in international economics and data analysis. Preference to seniors majoring in Economics or EP&E. SO RP

* **ECON 467b / GLBL 307b, Economic Evolution of the Latin American and Caribbean Countries** Ernesto Zedillo

Economic evolution and prospects of the Latin American and Caribbean (LAC) countries. Topics include the period from independence to the 1930s; import substitution and industrialization to the early 1980s; the debt crisis and the "lost decade"; reform and disappointment in the late 1980s and the 1990s; exploration of selected episodes in particular countries; and speculations about the future.

Prerequisites: intermediate microeconomics and macroeconomics. SO

* **ECON 469a / EP&E 470a / GLBL 325a, Health Inequality and Development** Staff

Economic analysis of the interactions between health, inequality, and development. Growth and development; health and well-being; burden of disease and funding for health; the relationship between growth and health; international health policy.

Prerequisite: introductory microeconomics and macroeconomics. SO

* **ECON 471b / EP&E 297b, Topics in Cooperative Game Theory** Pradeep Dubey

The theory and applications of cooperative games. Topics include matching, bargaining, cost allocation, market games, voting games, and games on networks.

Prerequisite: intermediate microeconomics.

* **ECON 473b / EP&E 227b / PLSC 343b, Equality** John Roemer

Egalitarian theories of justice and their critics. Readings in philosophy are paired with analytic methods from economics. Topics include Rawlsian justice, utilitarianism, the veil of ignorance, Dworkin's resource egalitarianism, Roemer's equality of opportunity, Marxian exploitation, and Nozickian procedural justice. Some discussion of American economic inequality, Nordic social democracy, and the politics of inequality. Recommended preparation: intermediate microeconomics. SO

* **ECON 474b / EAST 454b / GLBL 312b, Economic and Policy Lessons from Japan**

Stephen Roach

An evaluation of Japan's protracted economic problems and of their potential implications for other economies, including the United States, Europe, and China. Currency pressures, policy blunders, Abenomics, bubbles, and the global economic crisis of 2008; dangers to the global economy from a protracted postcrisis recovery period. Focus on policy remedies to avert similar problems in other countries.

Prerequisite: a course in macroeconomics. SO

* **ECON 475b / EP&E 286b, 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 481a / EP&E 298a, Empirical Microeconomics** Jessica Reyes

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

* **ECON 484b / EP&E 482b, Political Economy: Separatism and Annexation** Eric Weese

Formal political-economy models of jurisdiction formation, with a focus on changes in national and subnational boundaries. Application of models to issues such as problematic colonial boundaries in Africa, the apparent success of very small countries, and the role of democracy in recent municipal amalgamations in Canada and Japan. Prerequisites: econometrics and intermediate micro- and macroeconomics.

* **ECON 487a / AFST 360a / EP&E 365a / GLBL 313a / PLSC 417a, The Political Economy of AIDS in Africa** Nicoli Natrass

The impact of and responses to the AIDS pandemic in Africa examined from a comparative perspective. Focus on South and southern Africa. Some background in social science and economics desirable. SO

* **ECON 489a, Auctions and Bidding** Staff

Introduction to the theory of auctions and competitive bidding. Auction formats and their relation to strategies used by bidders and sellers. Topics include the revenue equivalence theorem, optimal auctions, the winner's curse, double auctions, auctions of multiple objects, and collusion. Prerequisite: intermediate microeconomics.

Senior Essay and Directed Reading Courses

* **ECON 491a and ECON 492b, The Senior Essay** Samuel Kortum

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, September 28, 2015. 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 6, 2016. Students writing senior essays who would like to be considered for Distinction in the Major must submit three copies of their essay to the Economics department office by 4:30 p.m. on Wednesday, April 6, 2016. Advisers are chosen with the assistance of the director of undergraduate studies. 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 will be held on Wednesday, September 2, at 4:30 p.m. and Thursday, September 3, at 1:30 p.m. in Room 106, 28 Hillhouse Avenue. Seniors planning to write either a one-term or a two-term senior essay should attend one of these meetings. Details regarding calculation of Distinction will be discussed and senior essay guidelines will be distributed.

* **ECON 498a and ECON 499b, Directed Reading** Samuel Kortum

Students desiring a directed reading course in special topics in economics not covered in other graduate or undergraduate courses may elect this course, usually 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. Does not meet the requirement for a departmental seminar.

Economics and Mathematics

Directors of undergraduate studies: Samuel Kortum (Economics), Rm. 305, 28 Hillhouse Ave., 432-6217 or 432-3574, qazi.azam@yale.edu; Andrew Casson (Mathematics), 216 LOM, 432-7056, andrew.casson@yale.edu

The Economics and Mathematics major is intended for students with a strong intellectual 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, 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 350 and 351
3. Two courses in econometrics, ECON 135 and 136 (with permission of the director of undergraduate studies in Economics, STAT 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
6. The senior seminar in mathematics, MATH 480

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

Distinction in the Major To be considered for Distinction in the Major, students must meet minimum grade standards, as specified in the Undergraduate Curriculum (p. 31) section, and submit a senior essay written either in an Economics department seminar or in ECON 491 or in ECON 491 and 492 to the Economics department; for details see under Economics (p. 249). (The paper must be written in a course taken in the senior year.) All courses beyond the introductory level in Mathematics and Economics are counted in the computation of grades for Distinction.

Approval of program Students interested in the major should consult both directors of undergraduate studies, and verify with each that their proposed program meets

the relevant guidelines. Registration forms must be signed by both directors of undergraduate studies each term.

REQUIREMENTS OF THE MAJOR

Prerequisites MATH 120; ECON 110 or 115; ECON 111 or 116

Number of courses 12 term courses beyond prereqs (incl senior req)

Distribution of courses 5 courses in math and 7 in econ

Specific courses required ECON 121 or 125; ECON 122 or 126; ECON 135, 136, 350, 351; MATH 222 or 225 (or 230, 231); MATH 300 or 301

Substitution permitted STAT 241 and 242 for ECON 135, with permission of DUS in Econ

Senior requirement Senior sem in math (MATH 480); optional senior essay in Econ

Education Studies

Director: Elizabeth Carroll, 111 SSS, 432-4631, elizabeth.carroll@yale.edu; yalecollege.yale.edu/content/education-studies

Education Studies is a special 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, philosophical, and theoretical underpinnings of the field and helps students understand the critical role of education in society. The course examines aspects of education practice, research, and policy.

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. The program selects students with appropriate background and interest in education practice, research, and/or policy, 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 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, at least two electives, a capstone research project during the spring term of the senior year, and the requirements of a Yale College major.

Courses

EDST 110a, Foundations in Education Studies Elizabeth Carroll

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

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 / CHLD 127a / PSYC 127a, Theory and Practice of Early Childhood Education: Implications of Curriculum and Policy** Carla Horwitz

Development of curricula for preschool children – infants through five-year-olds – in light of current research and child development theory. 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 131a / CHLD 131a / HLTH 270a, The Growing Child in Global Context** Erika Christakis

The effects of poverty, changing demographic and workforce trends, and access to early education and child care on the growing child around the world. Topics include antenatal care, mental and behavioral health, malnutrition and obesity, family support, schooling, sex selection and gender bias, parenting practices, migration and warfare, and child policy challenges in diverse cultural and socioeconomic contexts. SO

EDST 150a, Theory and Practice of Emotional Intelligence Marc Brackett

The role of emotions and emotional intelligence in everyday life and in education. Why emotions matter; how emotional intelligence is defined, measured, and taught; social and emotional learning. Research, theory, educational practices, and government policies that promote students' social, emotional, and academic competence from preschool through high school. 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. SO ½ Course cr

* **EDST 210a, Theory and Practice in American Education** Richard Hersh

Roles played by primary, secondary, and higher education in American society. The idealized purposes, nature, and value of education compared to actual practice. The goals of education at all levels; the degree to which such goals are being achieved. Vocational vs. liberal education; the obligations and limits of formal education in helping students overcome social and economic inequities. Preference to Education Studies Scholars and to students who have completed EDST 110. SO

* **EDST 240a, Cities, Suburbs, and School Choice** Staff

The changing dynamic between cities and suburbs and the role of individuals and institutions in promoting desegregation or perpetuating segregation since the mid-twentieth century. The government's role in the expansion of suburbs; desegregating schools; the rise of school choice through magnets and charters; the effects of inner-ring suburban desegregation and of urban gentrification on the landscape of education reform. Recommended preparation: EDST 110. Preference to Education Studies Scholars. SO RP

Electrical Engineering

Director of undergraduate studies: Mark Reed, 523 BCT, 432-4306, mark.reed@yale.edu; seas.yale.edu/departments/electrical-engineering

FACULTY OF THE DEPARTMENT OF ELECTRICAL ENGINEERING

Professors James Duncan, Jung Han, Roman Kuc, Tso-Ping Ma, A. Stephen Morse, Kumpati Narendra, Mark Reed, Peter Schultheiss (*Emeritus*), Lawrence Staib, Hemant Tagare, Leandros Tassiulas, J. Rimas Vaišnys, Y. Richard Yang

Associate Professors Minjoo Lee, Richard Lethin (*Adjunct*), Hongxing Tang, Sekhar Tatikonda

Assistant Professors Wenjun Hu, Amin Karbasi, Jakub Szefer, Fengnian Xia

Electrical Engineering broadly encompasses disciplines such as microelectronics, photonics, computer engineering, signal processing, control systems, and communications, all of which enable and underpin a modern technological society. Three degree programs are offered that allow students to select the level of technical depth appropriate for individual goals. The B.A. in Engineering Sciences (Electrical) is suitable for a career outside technology, in which a student nevertheless benefits from an appreciation of electrical engineering perspectives. The B.S. in Engineering Sciences (Electrical) provides more technical exposure while retaining academic options outside the electrical engineering core area. The B.S. in Electrical Engineering, accredited by the Engineering Accreditation Commission of ABET, Inc., is appropriate for highly motivated students who are interested in learning the scientific fundamentals and the technologies and creative processes of contemporary electrical engineering.

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 managerial or policy-making position that provides significant value to a company. An entrepreneurial path allows graduates to bring broad knowledge to a startup company, which can deliver a device that meets societal needs. Graduates who elect a nontraditional engineering path might complete a professional program such as business, law, or medicine, to which their engineering knowledge can be applied.

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. An interdepartmental program with Computer Science (p. 273) is also offered, and students can pursue interdisciplinary studies in other areas of engineering and science.

Prerequisites All three degree programs require MATH 112, 115, ENAS 151 or MATH 120 or higher, ENAS 130, 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.

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 in topics in engineering. These courses include:

1. Mathematics and basic science (four term courses): ENAS 194; MATH 222 or 225; APHY 322 or equivalent; STAT 238, 241, or equivalent.
2. Electrical engineering and related subjects (thirteen term courses): EENG 200, 201, 202, 203, 310, 320, 325, 348, 481 (the senior project); and four engineering electives, at least three of which should be at the 400 level. MENG 390, CPSC 365, and all 400-level Computer Science courses qualify as ABET electives.

Each student's program must be approved by the director of undergraduate studies.

For students who have taken the equivalent of one year of calculus in high school, a typical ABET-accredited B.S. program might include:

Freshman	Sophomore	Junior	Senior
EENG 200	EENG 202	APHY 322	EENG 481
EENG 201	EENG 203	EENG 310	Four electives
ENAS 151 or MATH 120	ENAS 130	EENG 320	
MATH 222	ENAS 194	EENG 325	
PHYS 180	STAT 241	EENG 348	
PHYS 181			

For students who start with MATH 112, a typical ABET-accredited B.S. program might include:

Freshman	Sophomore	Junior	Senior
EENG 201	EENG 200	EENG 202	APHY 322
ENAS 130	ENAS 151 or MATH 120	EENG 203	EENG 481
MATH 112	ENAS 194	EENG 310	STAT 241
MATH 115	MATH 222	EENG 320	Four electives
	PHYS 180	EENG 325	
	PHYS 181	EENG 348	

Faster-paced and slower-paced variations are possible, depending on the student's level of preparation and commitment to the major; consult with the director of undergraduate studies.

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., economics or cognitive psychology). 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, or, with permission of the director of undergraduate studies, 481 (the senior project); and six electives approved by the director of undergraduate studies, at least three of which must be at the 400 level.

For students who have taken the equivalent of one year of calculus in high school, a typical program for this degree might include:

Freshman	Sophomore	Junior	Senior
EENG 200	EENG 202	Three electives	EENG 471 or 472
EENG 201	EENG 203		Three electives
ENAS 151 or MATH 120	ENAS 130		
MATH 222	ENAS 194		
PHYS 180			
PHYS 181			

For students who start with MATH 112, a typical program for this degree might include:

Freshman	Sophomore	Junior	Senior
EENG 201	EENG 200	EENG 202	EENG 471 or 472
ENAS 130	ENAS 151 or MATH 120	EENG 203	Four electives
MATH 112	ENAS 194	Two electives	
MATH 115	MATH 222		
	PHYS 180		
	PHYS 181		

Faster-paced and slower-paced variations are possible, depending on the student's level of preparation and commitment to the major; consult with the director of undergraduate studies. The implied flexibility during the junior and senior years in the schedules above is often used to accommodate a second major, such as Economics (p. 249), or to master a related technical area, such as recent developments in biology or environmental studies.

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 or 225, or ENAS 194; EENG 200, 201, 202, and 471 or 472 (the senior requirement); and three approved electives.

Senior requirement A research or design project carried out in the senior year is required in all three programs. The student must take EENG 471, 472, or 481, present a written report, and make an oral presentation. The written report is due in the departmental office by the last day of reading period. Arrangements to undertake a project in fulfillment of the senior requirement must be made by the end of the reading period of the preceding term, when a registration form (available from the departmental office), signed by the intended faculty adviser and the director of undergraduate studies, must be submitted.

Approval of programs All Electrical Engineering and Engineering Sciences majors must have their programs approved by the director of undergraduate studies. Arrangements to take EENG 471, 472, or 481 must be made during the term preceding enrollment in the course. Courses taken Credit/D/Fail may not be counted toward the requirements of the major. 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; 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; STAT 238 or 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 or 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 or 472)

Courses

EENG 200a, Introduction to Electronics Minjoo Lee

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

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 Sekhar Tatikonda

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 203a or b, Circuits and Systems Design Fengnian Xia

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 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. ½ Course cr per term

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. Prerequisites: PHYS 180 and 181 or permission of instructor. Recommended preparation: EENG 200. 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, Digital Systems Roman Kuc

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 397b / ENAS 397b, 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 401b / APHY 321b, 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

EENG 406b, Photovoltaic Energy Minjoo Lee

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 408a, 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 410a, Photonics and Optical Electronics** Hongxing Tang

A survey of the enabling components and devices that constitute modern optical communication systems. Focus on the physics and principles of each functional unit, its current technological status, design issues relevant to overall performance, and future directions. QR, SC

EENG 412b, Energy Semiconductor Fundamentals Jung Han

The fundamentals of properties and mechanisms in which conventional semiconductor physics intersect with emerging applications. Connections between electrical, mechanical, thermal, and optical properties; contemporary applications in energy, information, and technology. Prerequisite: APHY 448. SC

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 437b / AMTH 437b / ECON 413b, 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 442a / AMTH 342a, 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

EENG 444a, Digital Communication Systems Wenjun Hu

Introduction to the fundamental theory underlying modern digital communication. Quantitative measures of information and data compression: the Huffman and Lempel-Ziv algorithms, scalar and vector quantization. Representations of signal waveforms: sampling, orthonormal expansions, waveforms as vectors in signal space. Transmission of signals through noisy channels; pulse amplitude and quadrature amplitude modulation, orthogonal signaling, signal design, noise processes, optimal detection, and error probability analysis. Applications to practical systems such as CD players, telephone modems, and wireless networks. Prerequisites: knowledge of signals and systems at the level of EENG 310; knowledge of basic probability at the level of STAT 241 (may be taken concurrently). QR

*** EENG 449a, Computers for Cognition** 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: EENG 201, 325, and CPSC 112. QR

EENG 450a, Applied Digital Signal Processing Roman Kuc

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, Wireless Communications** 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. Prerequisite: an introductory course in mathematics, engineering, or computer science.

EENG 454b / AMTH 364b / STAT 364b, Information Theory Staff

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 467a / ENAS 467a, Computer Organization and Architecture Jakub Szefer

Introduction to computer architecture, including computer organization, microprocessors, caches and memory hierarchies, I/O, and storage. Issues surrounding performance, energy, and security; processor benchmarking. Selected readings from current academic literature. Prerequisite: EENG 201, or with permission of instructor.

QR

*** EENG 471a and EENG 472b, 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. These courses may be taken at any appropriate time during the student's career and may be taken more than once. 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.

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. *After* MATH 120a or b and CPSC 112a or b, or with permission of instructor. QR, SC RP

*** EENG 481b, Advanced ABET Projects** Mark Reed

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 (Electrical Engineering), 523 BCT, 432-4306, mark.reed@yale.edu; Zhong Shao (Computer Science), 314 AKW, 432-6828, zhong.shao@yale.edu [F]; James Aspnes (Computer Science), 401 AKW, 432-1232, james.aspnes@yale.edu [Sp]

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.

The prerequisites for the major are MATH 112, 115, and ENAS 151 or MATH 120; CPSC 112; and PHYS 180 and 181, or 200 and 201. 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 in Electrical Engineering when planning their course schedules.

The major requires fifteen term courses beyond the prerequisites: CPSC 201, 202, 223, 323, and 365; EENG 200, 201, 202, and 203; one from MATH 222, 225, or STAT 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 (p. 265) and Computer Science (p. 210), or must be approved by the director of undergraduate studies 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 director of undergraduate studies in each department, EENG 471 or 472 may be used as an electrical engineering elective.

Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

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:

Freshman	Sophomore	Junior	Senior
EENG 200a	CPSC 201a	CPSC 202a	Senior project
ENAS 151a	EENG 202a	CPSC 323a	One elective
PHYS 180a			
EENG 201b	CPSC 223b	CPSC 365b	Two electives
PHYS 181b	EENG 203b	One elective	
	MATH 222b		

Students with no programming experience should take CPSC 112 in the fall of their freshman 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:

Freshman	Sophomore	Junior	Senior
CPSC 112a	CPSC 201a	CPSC 202a	Two electives
MATH 115a	EENG 200a	CPSC 323a	
PHYS 180a	EENG 202a	STAT 241a	
EENG 201b	CPSC 223b	CPSC 365b	Senior project
MATH 120b	EENG 203b	One elective	One elective
PHYS 181b			

For students with no calculus and no programming experience, a typical program would be:

Freshman	Sophomore	Junior	Senior
CPSC 112a	CPSC 201a	CPSC 202a	Two electives
MATH 112a	EENG 200a	CPSC 323a	
PHYS 170a	ENAS 151a	EENG 202a	
EENG 201b	CPSC 223b	CPSC 365b	Senior project
MATH 115b	MATH 222b	EENG 203b	One elective
PHYS 171b		One elective	

Students who start with MATH 112 may satisfy the physics prerequisite by taking PHYS 170 and 171 in their freshman 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.

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 director of undergraduate studies in each department.

Approval of programs The entire program of a student majoring in Electrical Engineering and Computer Science must be approved by the director of undergraduate studies in each department.

Accreditation Students interested in pursuing an ABET-accredited degree should consider the B.S. program in Electrical Engineering. See under Electrical Engineering (p. 265).

REQUIREMENTS OF THE MAJOR

Prerequisites MATH 112, 115, and ENAS 151 or MATH 120; CPSC 112; PHYS 180, 181, or 200, 201 (PHYS 170, 171 is 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; EENG 200, 201, 202, and 203; one from MATH 222 or 225 or STAT 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

Yale Climate & Energy Institute (YCEI) sponsors the Energy Studies Undergraduate Scholars program. The program promotes a multidisciplinary approach to the linked challenges of energy and climate, and provides students with training in the science and technology of energy, the environmental and social impacts of energy production and use, and the economics, planning, and regulation of energy systems and markets. Energy Studies Scholars acquire the broad knowledge and skills needed for advanced studies and for leadership in energy-related fields.

In addition to their participation in the program, Energy Studies Scholars must complete the requirements of a Yale College major. Yale College does not offer a major in energy studies.

Admission to the Energy Studies Undergraduate Scholars program is by application, normally in the second term of the sophomore year. Accepted students are assigned an adviser from the YCEI faculty. Upon successful completion of the program, students receive a letter from YCEI acknowledging their participation in the program and are invited to attend the annual Yale Alumni in Energy Conference.

For additional information, including program requirements and application instructions, visit the YCEI Web site (<http://climate.yale.edu/prog-init/energy-studies>).

Engineering

Dean of the School of Engineering & Applied Science: T. Kyle Vanderlick, 222 DL, 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 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 a joint major 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 under Applied Mathematics (p. 129), Biomedical Engineering (p. 167), Chemical Engineering (p. 173), Computer Science (p. 210), Electrical Engineering (p. 265), Engineering and Applied Science (p. 276), Environmental Engineering (p. 299), and Mechanical Engineering (p. 488).

Engineering and Applied Science

Director of undergraduate studies: Vincent Wilczynski, 238 DL, 432-4221, vincent.wilczynski@yale.edu

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 (p. 167), Chemical Engineering (p. 173), Computer Science (p. 210), Electrical Engineering (p. 265), Environmental Engineering (p. 299), and Mechanical Engineering (p. 488).

The School of Engineering and Applied Science (<http://seas.yale.edu>) 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 118a, Introduction to Engineering, Innovation, and Design** Eric Dufresne and Lawrence Wilen

An introduction to engineering, innovation, and design process. Principles of material selection, stoichiometry, modeling, data acquisition, sensors, rapid prototyping, and elementary microcontroller programming. Types of engineering and the roles engineers

play in a wide range of organizations. Lectures are interspersed with practical exercises. Students work in small teams on an engineering/innovation project at the end of the term. Priority to freshmen. RP

*** ENAS 120b / CENG 120b / ENVE 120b, Introduction to Environmental Engineering**

Jordan Peccia

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 335a / EP&E 204a, Professional Ethics Mercedes Carreras

A theoretical and case-oriented approach to ethical decision making. Concepts, tools, and methods for constructing and justifying solutions to moral problems that students may face as professionals. SO

*** ENAS 344b / MUSI 371b, Musical Acoustics and Instrument Design** Lawrence

Wilen

Practical study of musical acoustics. The physics and design of musical instruments, with attention to all aspects of sound, from the origin of the vibration in the instrument to the perception by the listener. Student teams design and construct novel instruments and produce relevant applications. Requires a basic knowledge of physics, including concepts of kinetic and potential energy and Newton's laws. QR, HU, SC RP

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 Marshall Long

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 151a or b / APHY 151a or b, Multivariable Calculus for Engineers Staff

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 or b / APHY 194a or b, Ordinary and Partial Differential Equations with Applications Staff

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 397b / EENG 397b, 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 440a / MENG 440a, Applied Numerical Methods I Beth Anne Bennett
The derivation, analysis, and implementation of various numerical methods. Topics include root-finding methods, numerical solution of systems of linear and nonlinear equations, eigenvalue/eigenvector approximation, polynomial-based interpolation, and numerical integration. Additional topics such as computational cost, error analysis, and convergence are studied in several contexts throughout the course. Prerequisites: MATH 115, and 222 or 225, or equivalents; ENAS 130 or some experience with Matlab, C++, or Fortran programming. QR RP

ENAS 441b / MENG 441b, Applied Numerical Methods II 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 RP

ENAS 467a / EENG 467a, Computer Organization and Architecture Jakub Szefer
Introduction to computer architecture, including computer organization, microprocessors, caches and memory hierarchies, I/O, and storage. Issues surrounding performance, energy, and security; processor benchmarking. Selected readings from current academic literature. Prerequisite: EENG 201, or with permission of instructor.

QR

ENAS 496b, Probability and Stochastic Processes Staff

A study of stochastic processes and estimation, including fundamentals of detection and estimation. Vector space representation of random variables, Bayesian and Neyman-Pearson hypothesis testing, Bayesian and nonrandom parameter estimation, minimum-variance unbiased estimators, and the Cramer-Rao bound. Stochastic processes. Linear prediction and Kalman filtering. Poisson counting process and renewal processes, Markov chains, branching processes, birth-death processes, and semi-Markov processes. Applications from communications, networking, and stochastic control. QR RP

English Language and Literature

Director of undergraduate studies: Stefanie Markovits, 411 LC, 432-9078, stefanie.markovits@yale.edu; associate director of undergraduate studies: Jill Richards, 107 LC, 432-2224, jill.richards@yale.edu; registrar: Erica Sayers, 106 LC, 432-2226, erica.sayers@yale.edu; assistant registrar: Jane Bordiere, 107 LC, 432-2224, jane.bordiere@yale.edu; english.yale.edu/welcome-english-major

FACULTY OF THE DEPARTMENT OF ENGLISH

Professors Elizabeth Alexander, Harold Bloom, Jessica Brantley, Leslie Brisman, David Bromwich, Ardis Butterfield, Jill Campbell, Janice Carlisle, Michael Denning, Wai Chee Dimock, Anne Fadiman (*Adjunct*), Roberta Frank, Paul Fry, 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, J. D. McClatchy (*Adjunct*), Alastair Minnis, Stephanie Newell, Annabel Patterson (*Emeritus*), Linda Peterson, Caryl Phillips, David Quint, Claude Rawson (*Emeritus*), Joseph Roach, Marc Robinson, John Rogers, Caleb Smith, Robert Stepto, Katie Trumpener, Michael Warner, Ruth Yeazell

Associate Professors Catherine Nicholson, Anthony Reed, Brian Walsh, R. John Williams

Assistant Professors Ian Cornelius, Marta Figlerowicz, Benjamin Glaser, Justin Neuman, Joseph North, Jill Richards, Sunny Xiang

Senior Lecturers James Berger, John Crowley, Michael Cunningham, Richard Deming, Shifra Sharlin, Fred Strebeigh, Cynthia Zarin

Lecturers Steven Brill, Danielle Chapman, Andrew Ehrgood, Randi Epstein, Joseph Gordon, Rona Johnston Gordon, Karin Gosselink, Alfred Guy, Jessie Hill, Briallen Hopper, Rosemary Jones, Heather Klemann, Verlyn Klinkenborg, Timothy Kreiner, Penelope Laurans, Katja Lindskog, Andrew McKendry, Heather McKendry, Pamela Newton, Mark Oppenheimer, Timothy Robinson, Karin Roffman, Pamela Schirmeister, Adam Sexton, Kim Shirkhani, Margaret Spillane, Michele Stepto, Barbara Stuart, Ryan Wepler, Grant Wiedenfeld, Christian Wiman, Bob Woodward, Carl Zimmer

The undergraduate program in English teaches students foundational research and writing skills and cultivates their powers of argument and analysis. Courses offered by the department are designed to develop students' understanding of important works of English, American, and world literatures in English; to provide historical perspectives from which to read and analyze these 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. Student writers at Yale work in all of the major genres, including fiction, poetry, play and film writing, nonfiction prose, and journalism, and they often enjoy the satisfaction of publication or performance for both local and national audiences.

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.

Introductory courses Courses numbered from 114 to 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 departmental Web site (<http://english.yale.edu/undergraduate/preregistration-places-introductory-courses>) for information about preregistration. Once preregistered, students must attend the first and all subsequent class 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 Courses numbered 150 and above are open to upperclassmen; the faculty recommends that students both within and outside the major prepare for such work with two terms of introductory English. Seminars are intended primarily for junior and senior English majors; sophomores and nonmajors may be admitted where openings are available.

When choosing courses, students should bear in mind that the English department's lecture courses and seminars play different roles in the curriculum. Lecture courses cover major periods, genres, and figures of English and American literature. They serve as general surveys of their subjects, and are typically offered every year or every other year. Seminars, by contrast, offer more specialized or intensive treatment of their topics, or engage topics not addressed in the lecture courses (for example, topics that span periods and genres). While seminars are often offered more than once, students should not expect the same seminars to be offered from one year to the next. Sophomores and juniors are encouraged to enroll in lecture courses in order to gain broad perspectives in preparation for more specialized study.

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 are available at the departmental office in 107 LC and on the English department Web site (<http://english.yale.edu/undergraduate/applications-and-deadlines>). Students with questions about this process should visit the office of the director of undergraduate studies in 107 LC.

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 (<http://yalecollege.yale.edu/academics/special-academic-programs/residential-college-seminar-program>).

Prerequisites 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 European and American literature. The prerequisites for the major are ENGL 125 and 126, the program's foundational courses in English poetry. Prospective English majors are strongly encouraged to complete the prerequisites, as well as one or more introductory literature courses such as ENGL 127, 129, or 130, by the end of the sophomore year. Those who have not enrolled in the Directed Studies program should consider taking both ENGL 129 and 130, foundational courses in the European literary tradition. A student may count up to five introductory courses toward the major.

If, due to a late change of major or other circumstance, it is impossible to take ENGL 125 and 126, students may satisfy the prerequisite for the major by taking (1) two other introductory literature courses from ENGL 115, 127, 129, 130, or DRST 001, 002 and (2) four advanced courses that deal substantially and intensively with poets included in ENGL 125 and 126. Two of these courses should substitute for two of the four units in ENGL 125 (Chaucer, Spenser, Shakespeare, and Donne), and two should substitute for two of the four units in ENGL 126 (Milton, Pope, Wordsworth, and Eliot, or other modern anglophone poet). Courses that deal with more than one poet are acceptable for this purpose, but substitute courses in Shakespeare must concern his poetry and not his plays. Substitute courses for the prerequisite may also count toward the requirement of three courses in English literature before 1800 and one course in English literature before 1900.

The major At least fourteen courses are required for the major, including prerequisites and 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 courses in literature written in English before 1800, one course in literature written in English before 1900, and one course in American literature, all representing a variety of periods and figures. Courses satisfying this requirement are indicated by the designations "Pre-1800 Lit," "Pre-1900 Lit," or "American Lit" in the course listings. Pre-1800 courses can, by definition, satisfy the pre-1900 requirement. Courses in American literature in the pre-1800 or pre-1900 periods may be counted toward both the relevant period requirement and the American requirement; (2) at least one seminar in both the junior and the senior years. Certain residential college seminars, with permission of the director of undergraduate studies, may be substituted for a departmental seminar; courses in creative writing may not.

A student whose program meets these requirements may, with permission of the director of undergraduate studies, count as electives toward the major as many as two upper-level courses in other departments. One of these courses should be a literature course in English translation or in another language, and neither may be counted toward the pre-1800 or the pre-1900 requirement. No more than two courses in creative writing may be counted toward the major; ENGL 123 does not count toward this limit. A student may petition the director of undergraduate studies for permission to include a third creative writing course.

Senior requirement Students 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 director of undergraduate studies; (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. A junior seminar in which the student, with the permission of the director of undergraduate studies 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, usually numbered 400–449, 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 substantial independent work and should be approximately twenty double-spaced pages in 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.

The 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. It should ordinarily be written on a topic 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 yearlong essays through application to the director of undergraduate studies. 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 400-level seminar.

Prospectuses and applications for senior essays should be submitted to the office of the English department in 107 LC or on line as directed on the English department Web site (<http://english.yale.edu/undergraduate/applications-and-deadlines>). They should be submitted during the designated sign-up period in the term before enrollment is intended.

Credit/D/Fail courses Courses taken Credit/D/Fail may be counted toward the requirements of the major.

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 director of undergraduate studies for advice about their course choices. A list of departmental representatives is available on the English department Web site (<http://english.yale.edu/undergraduate-program/english-major>).

Schedules for all majors should be discussed with, and approved by, a faculty adviser from the English department. The director of undergraduate studies and the associate director of undergraduate studies can also discuss and approve schedules. Schedules may be submitted to the residential college dean's office only after approval. During the sixth term, each student, in consultation with his or her adviser, completes a statement outlining progress in the major.

Individual programs of study In exceptional cases, a student whose interests and aims are well defined may, in consultation with the director of undergraduate studies, 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 the Literature Major (p. 464); Directed Studies (p. 224); American Studies (p. 107); African American Studies (p. 94); Ethnicity, Race, and Migration (p. 322); Theater Studies (p. 643); and Women's, Gender, and Sexuality Studies (p. 652).

The writing concentration The writing concentration is a special course of study open to students in the English major with demonstrated interest and achievement in writing. Admission is competitive. Interested English majors normally apply for admission to the concentration during the second term of their junior year. Application can also be made during the first term of the senior year. Every student admitted to the concentration must complete at least eleven literature courses as well as the other requirements of the major. Students admitted to the writing concentration may count up to four creative writing courses toward completion of the B.A. degree in English; the four courses must include at least two courses in one genre and at least one course in another genre; at least three must be at level 451 or higher. ENGL 120 and 123 do not count toward the writing concentration. Residential college seminars are not acceptable for credit toward the writing concentration, except by permission of the director of undergraduate studies. As one of the four writing courses, each student must complete ENGL 489, The Writing Concentration Senior Project, a tutorial in which students produce a single sustained piece of writing or a portfolio of shorter works. The writing concentration senior project may be offered in partial fulfillment of the senior requirement.

Applications for the writing concentration should be submitted to the English department office in 107 LC or on line as directed on the departmental Web site (<http://english.yale.edu/undergraduate/applications-and-deadlines>). They should be submitted during the designated sign-up period in the term before enrollment is intended. Students are admitted selectively on the overall strength of their performance in the major and on the quality of their writing samples.

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.

REQUIREMENTS OF THE MAJOR

Prerequisites ENGL 125 and 126 or, with 4 addtl courses in major English poets, 2 terms selected from 115, 127, 129, 130, or DRST 001, 002

Number of courses At least 14 courses (incl prereq and senior req)

Distribution of courses 3 pre-1800 lit courses, 1 pre-1900 lit course, 1 American lit course, all representing a variety of periods and figures; 2 sems, 1 in junior, 1 in senior year; no more than 5 courses numbered ENGL 130 or below; no more than 2 creative writing courses; *Writing concentration*—same, except 4 creative writing courses, incl 2 in one genre and 1 in another genre, with at least 3 numbered 451 or above; at least 11 lit courses

Substitutions permitted Residential college sem for departmental sem; 2 upper-level courses in other depts for electives in the major; 2 intro lit courses and 4 courses in major English poets for ENGL 125 and 126; all substitutions with permission of DUS

Senior requirement *Standard major*—2 senior sems; or 1 senior sem and one-term senior essay (ENGL 490); or, with DUS permission, two-term senior essay (ENGL 490, 491); *Writing concentration*—senior sem or one-term senior essay, and writing concentration senior project (ENGL 489)

* **ENGL 010b, Jane Austen** Stefanie Markovits

Close study of Austen's novels, with special attention to the critique of social and literary convention. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

English: Pre-1900 Lit

* **ENGL 011b / PLSC 025b, Lincoln in Thought and Action** David Bromwich

An intensive examination of the career, political thought, and speeches of Abraham Lincoln in their historical context. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

English: American Lit

English: Pre-1900 Lit

* **ENGL 012b / AMST 016b, Literary Cities: New York, Chicago, San Francisco**

Wai Chee Dimock

An introduction to American literature, told through the vibrant lives, ethnic diversities, and innovative genres revolving around three urban centers. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

English: American Lit

* **ENGL 015a / AFST 015a, South African Writing after Apartheid** Staff

An introduction to creative writing published in South Africa from the end of Apartheid in 1994 to the present. Close readings of contemporary fiction with additional material drawn from popular culture, including films, magazines, and music. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **ENGL 017b, Shakespeare's Major Tragedies** David Kastan

Detailed exploration of Shakespeare's *Hamlet*, *Othello*, *King Lear*, and *Macbeth*. What makes the plays great in a way that almost all readers and audiences have recognized. The works as plays to be performed, as drama to be read, as texts that have been constructed by the activities of various people, and as plays deeply embedded in the history of their own moment, as well as in later histories for which they are in some part responsible. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

English: Pre-1800 Lit

* **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 vision, globalization, generosity, experts and expertise, the good life, and dissent in American culture. 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. WR, HU

*** ENGL 120a or b, Reading and Writing the Modern Essay** Staff

Close study of selected works of nonfiction prepares students to become critical readers and to apply professionals' strategies to their own writing. Readings from such authors as Joan Didion, Malcolm Gladwell, Maxine Hong Kingston, N. Scott Momaday, George Orwell, Brent Staples, Jonathan Swift, Henry David Thoreau, Tom Wolfe, and Alice Walker. Written assignments, involving frequent revision, include autobiography, portraiture, nature writing, cultural critique, and formal argument. 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 include legal, humor, travel, or nature writing; writing about medicine and public health, religion, the visual arts, or food; writing in the social sciences; writing reviews of the performing arts; and writing for radio. May be repeated for course credit in a section that treats a different genre or style of writing; may not be repeated for credit toward the major. 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. HU

*** ENGL 125a or b, Major English Poets from Chaucer to Donne** Staff

An introduction to the diversity and the continuity of the English literary tradition through close reading of four poets from the fourteenth through the seventeenth centuries, Chaucer, Spenser, Shakespeare, and Donne. Emphasis on developing skills of literary interpretation and critical writing. WR, HU

*** ENGL 126b, Major English Poets from Milton to T. S. Eliot** Staff

An introduction to the diversity and the continuity of the English literary tradition through close reading of four poets from the seventeenth through the twentieth centuries, Milton, Pope, Wordsworth, and Eliot or another modern anglophone poet. Emphasis on developing skills of literary interpretation and critical writing. WR, HU

*** ENGL 127a or b, Readings in American Literature** Staff

Major works of the American literary tradition in a variety of poetic and narrative forms and in diverse historical contexts. Emphasis on analytical reading and critical writing. Authors may include Melville, Poe, Hawthorne, Bryant, Whitman, Dickinson, Thoreau, Emerson, Douglass, Stowe, Twain, Wharton, Cather, H. Crane, Stevens, Stein, L. Hughes, Paredes, Ellison, O'Connor, Ginsberg, Lowell, O'Hara, M. Robinson, C. McCarthy, Morrison, E. P. Jones, J. Díaz. WR, HU

English: American Lit

*** 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. 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. WR, HU

ENGL 132b, Science Fiction Alfred Guy

A survey of twentieth- and twenty-first-century science fiction, focusing on how changing technologies produce new ideas about human identity. Emphasis on innovations in science and engineering as well as new forms of social, political, and economic life. Works by Robert Heinlein, Philip K. Dick, Ursula Le Guin, and William Gibson. WR, HU

English: American Lit

*** ENGL 134a or b, Reading Fiction for Craft** Staff

Fundamentals of the craft of fiction writing explored through readings from classic and contemporary short stories and novels. Focus on how each author has used the fundamentals of craft. Writing exercises emphasize elements such as voice, structure, point of view, character, and tone. HU

English: Creative Writing

*** ENGL 135a or b, Reading Poetry for Craft** Staff

An introduction to reading and writing poetry. Classic examples from Shakespeare and Milton, the modernist poetics of Stein, Pound, Moore, and Stevens, and recent work in a variety of forms and traditions. Students develop a portfolio of poems and write an essay on the poetic craft of poets who have influenced their work. HU

English: Creative Writing

ENGL 149b / LING 109b, History of the English Language Roberta Frank

The evolution of English from its beginnings nearly 1500 years ago to the language of *Beowulf*, Chaucer, Shakespeare, Milton, Jane Austen, Melville, Twain, Langston Hughes, Woody Allen, Maya Angelou, and Kendrick Lamar. An overview of the 'Englishes' that populate our globe, including a look at the ways that technology affects language. HU

English: Pre-1900 Lit

*** ENGL 150a / LING 150a, Old English** Roberta Frank

An introduction to the 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*, all read in the original Old English. HU

English: Junior Seminar

English: Pre-1800 Lit

* **ENGL 158a, Readings in Middle English: Language and Symbolic Power** Ian Cornelius

The English language and its literature in the late medieval period. Survey of the period's literary language and genres; languages and forms of romance, dream vision, lyric, cycle drama, dialogue, and devotional prose; travel narratives that reflect on the truth of religious experience; problems of authorship and authority; first-person narration; encounters with religious and cultural alterity. Authors include Chaucer, Trevisa, Langland, Kempe, and Mandeville. WR, HU

English: Junior Seminar

English: Pre-1800 Lit

ENGL 200b, Shakespeare: Comedies and Romances Lawrence Manley

Love, sex, gender, society, and theater practice in Shakespeare's comic genres, from the early farces and romantic comedies to the problem plays and late romances. WR, HU

English: Pre-1800 Lit

ENGL 201a, Shakespeare: Histories and Tragedies Brian Walsh

A study of Shakespeare's histories and tragedies, focusing on attentive reading of the play texts and consideration of the theatrical, literary, intellectual, political, and social worlds in which the plays were written, performed, and experienced. HU

English: Pre-1800 Lit

* **ENGL 204b, Marlowe, Shakespeare, Jonson** David Kastan and Carla Baricz

Shakespeare's plays in the theatrical environment in which he wrote and flourished, and in relation to the two other great playwrights of his moment, Christopher Marlowe and Ben Jonson. The achievements, relationships, and rivalries of the three playwrights; why Shakespeare has become a poet "for all times" while Marlowe and Jonson are viewed as "souls of the age." WR, HU

English: Pre-1800 Lit

English: Junior Seminar

* **ENGL 209b, 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

English: Junior Seminar

English: Pre-1800 Lit

* **ENGL 238a, Poetry and Modernity from the Restoration to Romanticism** Jonathan Kramnick

The role of poetry in the creation of modern concepts of self and social order during the long eighteenth century. Poems that feature changing ideas about gender and sexuality, urban communities and ethics, science and the natural landscape, political sovereignty, empire and race, animal life, and personal identity. Writers include Dryden, Rochester, Behn, Swift, Pope, Thomson, Cowper, Blake, and Wordsworth. WR, HU

English: Junior Seminar

English: Pre-1800 Lit

* **ENGL 244b / FILM 397b / THST 228b, Writing about the Performing Arts**

Margaret Spillane

Introduction to journalistic reporting on performances as current events, with attention to writing in newspapers, magazines, and the blogosphere. The idea of the audience explored in relation to both a live act or screening and a piece of writing about such an event. Students attend screenings and live professional performances of plays, music concerts, and dance events. HU

English: Creative Writing

* **ENGL 245a or b, Introduction to Writing Fiction** Staff

An intensive introduction to the craft of fiction, designed for aspiring creative writers. Focus on the fundamentals of narrative technique and peer review.

English: Creative Writing

* **ENGL 246a or b, Introduction to Writing Poetry** Cynthia Zarin

A seminar workshop for students who are beginning to write poetry or who have no prior workshop experience at Yale. RP

English: Creative Writing

* **ENGL 247a / HSAR 460a, Writing about Contemporary Figurative Art** Margaret Spillane

A workshop on journalistic strategies for looking at and writing about contemporary paintings of the human figure. Practitioners and theorists of figurative painting; controversies, partisans, and opponents. Includes field trips to museums and galleries in New York City. Admission by application only. Application details and forms are available at english.yale.edu/undergraduate/applications-and-deadlines. WR, HU

English: Creative Writing

* **ENGL 248a / EVST 325a, Nature Writing in Britain and the English-Speaking World** Linda Peterson

Natural history and environmental writing in the English-speaking world from the late eighteenth century to the present. Readings include Gilbert White's *Natural History of Selborne*, Thoreau's *Walden*, and Darwin's *Voyage of the Beagle*, as well as recent work by writers from Canada, the United States, India, and South Africa. Pre-1900 with permission of instructor. WR, HU

English: Junior Seminar

* **ENGL 250a, Romantic Poetry** Leslie Brisman

Major works of Wordsworth, Coleridge, Byron, P. B. Shelley, and Keats, as well as selections from the works of Blake and from Mary Shelley's *Frankenstein*. HU

English: Junior Seminar

English: Pre-1900 Lit

* **ENGL 255b, Writing Humor** Ryan Wepler

Skills essential to humor writing, with an emphasis on texture, tone, character, and narrative. Students read the work of classmates and pieces by professional humor writers with the goal of generating an ever-expanding set of techniques for both reading humor and writing humorously. Recommended preparation: ENGL 120. WR

English: Creative Writing

* **ENGL 257b / THST 244b, Writing about Movement** Staff

A seminar and workshop in writing about the human body in motion, with a focus on the art of dance. Close reading of exemplary dance writing from the nineteenth

and twentieth centuries. The challenges and possibilities of writing artfully about nonverbal expression. Students use a variety of approaches to write about dance and other performance genres. No previous knowledge of dance required. WR, HU
English: Creative Writing

* **ENGL 264a, Victorian Crime** Janice Carlisle

Crimes of passion, greed, and desperation as they are represented in Victorian literature from Dickens to Conan Doyle and in the graphic arts from Cruikshank to Frith. Readings include fiction, journalism, poetry, and stage melodramas; art works range from narrative paintings in oil to popular wood engravings. WR, HU
English: Pre-1900 Lit
English: Junior Seminar

ENGL 265b, The Victorian Novel Ruth Yeazell

A selection of nineteenth-century novels, with attention to cultural contexts. Authors chosen from the Brontës, Gaskell, Dickens, Collins, Eliot, Trollope, and Hardy. HU
English: Pre-1900 Lit

* **ENGL 275b, Emerson, Hawthorne, 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, short fiction, and essays. WR, HU
English: Pre-1900 Lit
English: American Lit
English: Junior Seminar

* **ENGL 278a, Antebellum American Literature** Michael Warner

Introduction to writing from the period leading up to and through the Civil War. The growth of African American writing in an antislavery context; the national book market and its association with national culture; emergence of a language of environment; romantic ecology and American pastoral; the "ecological Indian"; evangelicalism and the secular; sentimentalism and gender; the emergence of sexuality; poetics. WR, HU
English: Junior Seminar
English: Pre-1900 Lit
English: American Lit

* **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
English: Junior Seminar
English: American Lit

ENGL 282a / AMST 282a, American Literature from the Civil War to World War I
Caleb Smith

A survey of American literature from the late nineteenth century to the early twentieth. Social protest, literary experimentation, and avant-garde aesthetics. Readings may include works by Twain, DuBois, James, Stein, Williams, and Faulkner. HU
English: American Lit

* **ENGL 288a / THST 291a, Eloquence: Classical Rhetoric for Modern Media** Joseph Roach

Classical rhetoric, from Demosthenes to the digital age: the theory and practice of persuasive public speaking and speech writing. Open to junior and senior Theater Studies majors, and to nonmajors with permission of the instructor. Students must preregister during the reading period of the preceding term. HU

English: Junior Seminar

ENGL 291b / AMST 261b, The American Novel since 1945 Amy Hungerford

American fiction; works by Richard Wright, Flannery O'Connor, Patricia Highsmith, Vladimir Nabokov, Jack Kerouac, Philip Roth, Marilynne Robinson, Toni Morrison, Cormac McCarthy, Alison Bechdel, and Junot Diaz. HU

English: American Lit

* **ENGL 292a / WGSS 297a, Imagining Sexual Politics, 1960s to the Present**

Margaret Homans

Historical survey of works of fiction, poetry, drama, and creative nonfiction that have shaped and responded to feminist, queer, and transgender thought since the start of second-wave feminism. Authors include Wittig, Rich, Broumas, Brown, Russ, Walker, Lorde, Morrison, Kingston, Atwood, Cisneros, Bechdel, and Rankine. WR, HU

English: Junior Seminar

English: American Lit

ENGL 293b / AFAM 140b / AMST 211b / ER&M 210b / WGSS 211b, Race and Gender in American Literature Birgit Rasmussen

The role of literature in constructing representations of America as an idea, a nation, a colonial settlement, and a participant in world affairs. What kind of place America is and who belongs there; the consequences of America's history for its national literature. Emphasis on the ways texts represent and contest social concepts of race and gender difference. WR, HU

English: American Lit

* **ENGL 296a / AFAM 296a / AMST 296a / WGSS 292a, Contemporary African American Literature** Elizabeth Alexander

A survey of African American literature since 1970. Authors include Toni Morrison, Alice Walker, Rita Dove, Yusef Komunyakaa, Anna Deavere Smith, Danzy Senna, and others. Topics include black feminist literature, black gay and lesbian literature, developments in literary criticism and theory, and contemporary black drama. HU

ENGL 300b / LITR 300b, Introduction to Theory of Literature Martin Hägglund

An examination of concepts and assumptions in contemporary views of literature. Theories of meaning, interpretation, and representation. Critical analysis of formalist, psychoanalytic, structuralist, poststructuralist, Marxist, and feminist approaches to theory and to literature. HU

* **ENGL 307a / FILM 476a, Hollywood Novel and Film** Charles Musser

The history of novels and films about Hollywood. Ways in which the closely related forms of novel and film portray "the dream factory"—its past, present, and future—as well as the way the forms interact. Books include *Merton at the Movies* (1922), *I Should Have Stayed Home* (1938), *Loves of the Last Tycoon* (1940), and *The Player* (1988). Films include *What Price Hollywood?* (1932), *A Star is Born* (1937), *Sunset Boulevard* (1950), *In*

a Lonely Place (1950), and *The Player* (1992). May not be taken after AMST S321/FILM S180. HU

English: Junior Seminar

English: American Lit

* **ENGL 308a / FILM 242a / HUMS 454a / LITR 398a, Interpreting Film Masterpieces** Dudley Andrew and David Bromwich

Exploration of seven auteurs from Europe and Hollywood, 1937–1967. Assessment of methods that deepen appreciation of the films and the medium. WR, HU

English: Junior Seminar

* **ENGL 313b, Poetry and Political Sensibility** Staff

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

English: Junior Seminar

* **ENGL 325b / AMST 257b, 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

English: American Lit

English: Junior Seminar

* **ENGL 334b / ER&M 332b, Postcolonial World Literatures, 1945 to the Present** Staff

Introduction to key debates about postwar world literatures in English, to the politics of English as a language of postcolonial literature, and to debates about globalization and culture. Themes include colonial history, postcolonial migration, translation, national identity, cosmopolitanism, and global literary prizes. WR, HU

English: Junior Seminar

* **ENGL 336a / LITR 323a / THST 303a, The Opera Libretto** J. D. McClatchy

A selective survey of the genre from its seventeenth-century Italian origins to the present day. The libretto's history, from *opera seria* to *opéra comique* to melodrama, featuring libretti by Hofmannsthal, W. S. Gilbert, and Auden. Emphasis on literary adaptations, from Da Ponte and Beaumarchais to Britten and Thomas Mann. Source material includes works by Shakespeare, Schiller, Hugo, Melville, and Tennessee Williams. Readings in English; musical background not required. WR, HU

English: Junior Seminar

ENGL 344a / ER&M 236a, Global Fictions Justin Neuman

Survey of literary fiction from the late nineteenth century to the present in which globalization serves as a major theme and primary frame of reference. Vectors of globalization include energy, transportation, capital, drugs, war, media, tourism, and sexuality. HU

* **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

English: Junior Seminar

* **ENGL 352b / ER&M 354b, Asian American Literature** Staff

A study of how literature services, reflects, and contradicts the political formation "Asian American." The role of literature in the Asian American movement of the 1960s and 1970s; representations of literariness in contemporary Asian American novels, poems, and plays. WR, HU

English: American Lit

English: Junior Seminar

* **ENGL 353a / LITR 463a, Medieval Celtic Literature** David Gabriel

Major texts of Celtic literature, focusing on works from the birth of vernacular literature in the Middle Ages to the early modern period. Cultural, historical, and literary issues surrounding works in the Irish and Welsh languages; literary culture in Breton, Cornish, Scottish Gaelic, and Manx. Genres include lyric and bardic poetry, heroic and religious narrative, and early Arthurian works. Readings in English translation; no knowledge of Celtic languages assumed. HU TR

English: Pre-1800 Lit

English: Junior Seminar

* **ENGL 356a, The Young Adult Dystopian Novel** Jill Richards

Survey of young adult fiction across the twentieth century, with a focus on American writers. Topics include environmental apocalypse, biopolitics, youth indebtedness, juvenile sentencing, sexual violence, and racial profiling. Creative and critical writing components. WR, HU

English: Junior Seminar

English: American Lit

* **ENGL 357a / WGSS 340a, Feminist and Queer Theory** Margaret Homans

Historical survey of feminist and queer theory from the Enlightenment to the present, with readings from key British, French, and American works. Focus on the foundations and development of contemporary theory. Shared intellectual origins and concepts, as well as divergences and conflicts, among different ways of approaching gender and sexuality. WR, HU

English: Junior Seminar

* **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, Dr. Seuss, Maurice Sendak, Philip Pullman, and Neil Gaiman.

WR, HU RP

English: Junior Seminar

* **ENGL 395a / LITR 154a, The Bible as 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. Pre-1800 with completion of supplementary assignments in the language of the King James Bible. If there is sufficient interest, a second section will be offered. WR, HU RP

English: Junior Seminar

English: Pre-1800 Lit

* **ENGL 401a, J. M. Coetzee** Justin Neuman

A study of novels and other writings of J. M. Coetzee, exploring issues of animal and human rights, apartheid, race, gender, colonialism and postcolonialism, sex, pain, religion, and globalization. HU

English: Senior Seminar

* **ENGL 411b / FILM 475b, Shakespeare on Film** Brian Walsh

A survey of the lively tradition of putting Shakespeare's plays on film, from the beginnings of cinema at the close of the nineteenth century to the present day. WR, HU

English: Senior Seminar

* **ENGL 412b, Victorian Poetry** Leslie Brisman

The major Victorian poets, Tennyson and Browning, in the context of the romanticism they inherited and transformed. A selection of other Victorians whose genius or popularity warrants attention, including Morris, the Rossetts, Hardy, Swinburne, Hopkins, and Barrett Browning. WR, HU RP

English: Senior Seminar

English: Pre-1900 Lit

* **ENGL 414b / HUMS 453b, Utopia** John Rogers

An examination of utopian fiction. Focus on works from early modern England, with some attention to more recent utopian writings. The genre's Platonic origins, its ties to early modern political philosophy, its role in the rise of the novel, and its legacy in science fiction. Utopian literature's abiding concern with issues of social discipline, religion, education, science, marriage, and sex. WR, HU

English: Senior Seminar

English: Pre-1800 Lit

* **ENGL 416a, Contemporary British Fiction** Caryl Phillips

A study of literature that responds to a changing post-World War II Britain, with attention to the problem of who "belongs" and who is an "outsider." Authors include Alan Hollinghurst, Kazuo Ishiguro, Colin McInnes, Samuel Selvon, Ruth Praver Jhabvala, and John Osborne. WR, HU RP

English: Senior Seminar

* **ENGL 421a, Austen and Brontë and Twentieth-Century Women's Novels** Katie Trumpener

Examination of ways that twentieth-century British, American, and anglophone writers rewrite, revise, and reconcile key novels by Jane Austen and Charlotte Brontë as prototypes of a women's novel tradition. Particular attention to narrative voice, reader identification, and the novel's function as a record of social norms and as an agent of historical change. Advanced courses are open to students normally after two terms of English or the equivalent, or with the permission of the instructor. Starred courses may be used to fulfill the two-seminar requirement for English majors. WR, HU

English: Senior Seminar

English: Pre-1900 Lit

* **ENGL 427a, Shakespeare's Political Plays** David Bromwich

Reading and interpretation of selected histories and tragedies from *Richard II* to *Coriolanus*. Prerequisite: a previous course in Shakespeare. WR, HU

English: Senior Seminar

English: Pre-1800 Lit

* **ENGL 430b / AMST 425b, American Culture and the Rise of the Environment**

Michael Warner

U.S. literature from the late eighteenth century to the Civil War explored in the context of climate change. Development of the modern concept of the environment; the formation and legacy of key ideas in environmentalism; effects of industrialization and national expansion; utopian and dystopian visions of the future. WR, HU

English: American Lit

English: Senior Seminar

* **ENGL 433b / AMST 344b, The Nonhuman in Literature since 1800** Wai Chee

Dimock

Nonhuman life forms in fiction and poetry from the nineteenth century to the twenty-first, including plants and animals, monsters and viruses, intelligent machines, and extraterrestrial aliens. The complexity and variety of nonhuman ecology. WR, HU

English: American Lit

English: Senior Seminar

* **ENGL 434b, Chaucer and Discourses of Dissent** Alastair Minnis

A study of Chaucer's *Book of the Duchess*, *House of Fame*, and *Legend of Good Women*, in addition to substantial selections from his *Canterbury Tales*. The texts' relations to the discourses of dissent current in Chaucer's day, an age of extreme political, social, and intellectual turmoil. WR, HU RP

English: Pre-1800 Lit

English: Senior Seminar

* **ENGL 435a, Henry James** Ruth Yeazell

Selected novels by Henry James, from *Roderick Hudson* through *The Golden Bowl*.

Particular attention to the international theme and to the ways in which James's later novels revisit and transform the matter of his earlier ones. WR, HU

English: Senior Seminar

English: American Lit

* **ENGL 440a / AMST 414a, Poetry and Debates on the Value of Arts and Humanities**

James Berger

Attacks on and defenses of poetry in the broadest sense (as culture, the aesthetic, the humanities) from Plato to contemporary debates over the proper focus of education. The value of poetry in terms of knowledge claims, moral impact, economic utility, and other categories particular to artistic production and reception. WR, HU

English: Senior Seminar

* **ENGL 445b / AFAM 437b / AMST 420b, Ralph Ellison in Context** Robert Stepto

The complete works of Ralph Ellison and related works (in various art forms) of his contemporaries, including Wright, Baldwin, Bearden, and Louis Armstrong. For seniors who intend to fulfill the senior requirement for the English major by enrolling in a senior seminar. Open to interested juniors and seniors outside the major when space is available. WR, HU

* **ENGL 446b / WGSS 426b, Virginia Woolf** Margaret Homans

A study of the major novels and other writings by Virginia Woolf, with additional readings in historical contexts and in Woolf biography and criticism. Focus on Woolf's

modernist formal experimentation and on her responses and contributions to political movements of her day, principally feminism and pacifism; attention also to the critical reception of her work, with emphasis on feminist and queer literary criticism and theory. WR, HU

English: Senior Seminar

*** ENGL 449a / AFST 449a, Challenges to Realism in Contemporary African Fiction**
Staff

Introduction to experimental African novels that challenge realist and documentary modes of representation. Topics include mythology, gender subversion, politics, the city, migration, and the self. Ways of reading African and postcolonial literature through the lenses of identity, history, and nation. WR, HU

English: Senior Seminar

*** ENGL 450b, Daily Themes** Cynthia Zarin

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

English: Creative Writing

*** ENGL 453b / THST 320b, Playwriting** Donald Margulies

A seminar and workshop in writing for the stage. Readings include modern American and British plays by Pinter, Mamet, Churchill, Kushner, Williams, and Wilder.

Emphasis on play structure, character, and conflict. In addition to weekly exercises, students write a one-act play. RP

English: Creative Writing

*** ENGL 454a, Nonfiction Writing: Voice and Structure** Fred Streibeigh

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

English: Creative Writing

*** 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

English: Creative Writing

*** ENGL 456b / HUMS 427b / JDST 316b / 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

English: Creative Writing

*** ENGL 459a / EVST 215a, Writing about Science and the Environment** Carl Zimmer

An intensive workshop in writing about science and the environment for a broad audience. Translating complex subjects into elegant prose, conducting interviews,

handling controversies, researching articles, and finding one's voice. Readings include exemplary works ranging from newspaper articles to book excerpts. Admission by application only. Application details and forms are available at english.yale.edu/undergraduate/applications-and-deadlines. WR RP

English: Creative Writing

* **ENGL 460a or b / AFAM 483b, Advanced Poetry Writing** Staff

A seminar and workshop in the writing of verse. May be repeated for credit with a different instructor. RP

English: Creative Writing

* **ENGL 461b / FILM 396b, Writing for Film: Voice and Vision** John Crowley

Practice in all aspects of writing a screenplay. Focus on elements shared with other forms of fiction, including story, character, narrative, personal voice, and audience expectations. Study of one or more published screenplays in conjunction with viewings of the resulting films. Students plan, pitch, outline, and write a large part of a single screenplay, in addition to shorter exercises in screenplay craft. RP

English: Creative Writing

* **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.

English: Creative Writing

* **ENGL 467a or b / PLSC 253a or b, Journalism** Staff

An intensive workshop in the journalism profession and its changing role and accelerating challenges. Definitions of journalism; the role of journalism in a democracy and a free market; differences between information, news, vicarious news, and entertainment; knowing and telling a good story; the structure of newspaper articles, blogs, online newspapers and magazines, mixed digital media, magazine features, television reports, and nonfiction books; interviewing techniques; fairness; sourcing; the economics of journalism; and audience. Fulfills the core seminar requirement for Yale Journalism Scholars. No prerequisites. WR

English: Creative Writing

* **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

English: Creative Writing

* **ENGL 470a or b, Tutorial in Writing** Jessica Brantley

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. Prerequisites: two courses in writing.

English: Creative Writing

* **ENGL 473b, The Journalism of Ideas** Mark Oppenheimer

The history and practice of writing journalistic essays or articles in which the principal actor is not a person but a notion or idea. Conventions, tropes, and authorial strategies that give rise to the best work in the genre; focus on twentieth-century writers such

as George Orwell, Hannah Arendt, Tom Wolfe, Renata Adler, and Janet Malcolm. Students write their own example of the journalism of ideas. WR, HU RP
English: Creative Writing

* **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
English: Creative Writing

* **ENGL 476a, Contemporary Poetry and Poetics** Richard Deming

A study of contemporary poetry and poetics that explores both literary criticism and creative writing. Ways to assess prevailing poetic values and articulate one's own. Attention to critical skills for engaging recent developments in the field; development of a sense of the current aesthetic landscape. Includes four additional class meetings with influential contemporary poets who represent a variety of styles and modes. WR
English: Creative Writing

* **ENGL 479a / ER&M 437a / THST 437a, Playwriting Workshop: Adaptation, 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
English: Creative Writing

* **ENGL 488a or b, Special Projects for Juniors or Seniors** Jessica Brantley

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 by December 9, 2015, for spring-term projects and by April 22, 2016, for fall-term projects. Application details and forms are available at english.yale.edu/undergraduate/applications-and-deadlines.

* **ENGL 489a or b, The Writing Concentration Senior Project** Jessica Brantley

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 13, 2015, for spring-term projects and by April 14, 2016, 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** Jessica Brantley

Students wishing to undertake an independent senior essay in English must apply through the office of the director of undergraduate studies. Applications are due by

December 9, 2015, for spring-term essays or for yearlong essays beginning in the spring term; applications are due by April 22, 2016, for fall-term essays or for yearlong essays beginning in the fall term. Application details and forms are available 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** Jessica Brantley

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. After ENGL 490.

OTHER COURSES RELATED TO ENGLISH LANGUAGE AND LITERATURE

THST 110a and THST 111b, Survey of Theater and Drama Marc Robinson and Joseph Roach

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 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

* **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. RP

* **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

* **THST 442b, Scene Study** Joseph Roach

Ensemble studio explorations of classic scenes from the repertoire of modern and contemporary drama. Admission by audition only. Preference to Theater Studies majors. HU

Environment

At Yale, the environment is studied from a variety of perspectives. Majors are offered in Architecture (p. 143), Chemical Engineering (p. 173), Ecology and Evolutionary Biology (p. 241), Environmental Engineering (p. 299), Environmental Studies (p. 303), and Geology and Geophysics (p. 359). The program in Forestry & Environmental Studies (p. 342) offers courses in environmental science, policy, and management. Many other departments and programs offer courses pertinent to the study of environment, including American Studies (p. 107), Anthropology (p. 118), Chemistry (p. 178), Economics (p. 249), English (p. 279), Global Affairs (p. 377), History (p. 394), History of Art (p. 418), Political Science (p. 561), Sociology (p. 611), and Study of the City (p. 643). Some professional schools and programs offer relevant courses that may admit undergraduates, including Public Health (<http://publichealth.yale.edu>), Forestry & Environmental Studies (<http://environment.yale.edu>), the Law School (<http://www.law.yale.edu>), and the School of Management (<http://som.yale.edu>).

Environmental Engineering

Director of undergraduate studies: Jordan Peccia, 313C ML, 432-4385, jordan.peccia@yale.edu; seas.yale.edu/departments/chemical-and-environmental-engineering

FACULTY ASSOCIATED WITH THE PROGRAM IN ENVIRONMENTAL ENGINEERING

Professors Paul Anastas (*Forestry & Environmental Studies*), Michelle Bell (*Forestry & Environmental Studies*), Gaboury Benoit (*Forestry & Environmental Studies*), Ruth Blake (*Geology & Geophysics*), Stephen Edberg (*School of Medicine*), Menachem Elimelech (*Chemical & Environmental Engineering*), Thomas Graedel (*Forestry & Environmental Studies*), Edward Kaplan (*School of Management*), Yehia Khalil (*Adjunct*) (*Chemical & Environmental Engineering*), Lisa Pfefferle (*Chemical & Environmental Engineering*), Joseph Pignatello (*Adjunct*) (*Chemical & Environmental Engineering*), James Saiers (*Forestry & Environmental Studies*)

Associate Professors Jaehong Kim (*Chemical & Environmental Engineering*), Jordan Peccia (*Chemical & Environmental Engineering*), Julie Zimmerman (*Chemical & Environmental Engineering*)

Assistant Professors Drew Gentner (*Chemical & Environmental Engineering*), Desiree Plata (*Chemical & 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.

Requirements of the major 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 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 103 and 104. 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 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 315 or 448, EVST 344, and MENG 361 or F&ES 714. At least three electives must be chosen in consultation with the director of undergraduate studies, preferably within one of the following tracks: environmental engineering technology, sustainability, global health, economics, or energy and climate change.

B.A. degree program in Engineering Sciences (Environmental) The B.A. degree program requires nine term courses beyond the prerequisites, including the senior requirement. Students take ENVE 120, 360, and either 373 or 377. Five electives must be chosen in consultation with the director of undergraduate studies.

Senior requirement Students in the B.S. program must pass ENVE 416 in their senior year. Students in the B.A. program must pass ENVE 490 in their senior year.

Credit/D/Fail No course taken Credit/D/Fail may count toward the major, including prerequisites.

REQUIREMENTS OF THE MAJOR 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 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

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 490

Courses

* ENVE 120b / CENG 120b / ENAS 120b, Introduction to Environmental Engineering

Jordan Peccia

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 202b / CHEM 102b / EVST 102b, Introduction to Green Chemistry

Paul Anastas

Overview of the basic concepts and methods needed to design processes and synthesize materials in an environmentally benign way. Related issues of global sustainability. Case studies that suggest possible solutions for the serious environmental and toxicological issues currently facing industry and society. Intended for non-science majors with a basic high school background in chemistry and physics, as well as high school algebra. Does not satisfy premedical chemistry requirements or requirements for the Chemistry major.

ENVE 210a / CENG 210a, Principles of Chemical Engineering and Process Modeling

André Taylor

Analysis of the transport and reactions of chemical species as applied to problems in chemical, biochemical, and environmental systems. Emphasis on the interpretation of laboratory experiments, mathematical modeling, and dimensional analysis. Lectures include classroom demonstrations. Prerequisite: MATH 120 or permission of instructor.

QR, SC RP

ENVE 315b / CENG 315b, Transport Phenomena

Michael Loewenberg

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 327a / F&ES 327a / G&G 327a, Atmospheric Chemistry Nadine Unger

The chemical and physical processes that determine the composition of the atmosphere; implications for climate, ecosystems, and human welfare. Origin of the atmosphere; photolysis and reaction kinetics; atmospheric transport of trace species; stratospheric ozone chemistry; tropospheric hydrocarbon chemistry; oxidizing power, nitrogen, oxygen, sulfur, and carbon cycles; interactions between chemistry, climate, and biosphere; aerosols, smog, and acid rain. Prerequisites: CHEM 161, 165, or 167 (or CHEM 115 or 118), and MATH 120, or equivalents. ENAS 194 recommended. QR, SC

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 Drew Gentner

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 210. 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 410Lb, Environmental Technology in the Developing World** Jaehong Kim

Practical application of environmental engineering fundamentals to solve real-world environmental and human-health problems in underdeveloped regions of the world. Issues related to water and wastewater treatment, water- and air-quality monitoring and control, subsurface remediation, and hygienic infrastructure. Includes a weeklong field trip to Nicaragua during spring break. Prerequisites: ENVE 373 and 377. Priority to Environmental Studies majors. ½ Course cr

ENVE 416b / CENG 416b, Chemical Engineering Process Design Paul Van Tassel and Corey Wilson

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 441a, Biological Processes in Environmental Engineering Jordan Peccia
Fundamental aspects of microbiology and biochemistry, including stoichiometry, kinetics, and energetics of biochemical reactions, microbial growth, and microbial ecology, as they pertain to biological processes for the transformation of environmental contaminants; principles for analysis and design of aerobic and anaerobic processes, including suspended- and attached-growth systems, for treatment of conventional and hazardous pollutants in municipal and industrial wastewaters and in groundwater. Prerequisites: CHEM 161, 165, or 163, 167 (or CHEM 112, 113, or 114, 115, or 118); MCDB 290 or equivalent; or with permission of instructor. SC

ENVE 448a, Environmental Transport Processes Menachem Elimelech
Analysis of transport phenomena governing the fate of chemical and biological contaminants in environmental systems. Emphasis on quantifying contaminant transport rates and distributions in natural and engineered environments. Topics include distribution of chemicals between phases; diffusive and convective transport; interfacial mass transfer; contaminant transport in groundwater, lakes, and rivers; analysis of transport phenomena involving particulate and microbial contaminants. Prerequisite: ENVE 120 or permission of instructor. QR, SC

ENVE 473b, Air Quality and Energy Drew Gentner
The production and use of energy explored as a source of air pollution worldwide. Assessment of emissions and physical/chemical processes; the effects of emissions from energy sources; the behavior of pollutants in energy systems and in the atmosphere. Topics include traditional and emerging energy technology, climate change, atmospheric aerosols, tropospheric ozone, and transport/modeling/mitigation. Prerequisite: ENVE 373 or equivalent. SC

* **ENVE 490a or b, Senior Project** Jordan Peccia
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: Paul Sabin, 2677 HGS, 436-2516,
paul.sabin@yale.edu; www.yale.edu/evst

FACULTY ASSOCIATED WITH THE PROGRAM OF ENVIRONMENTAL STUDIES

Professors D. Michelle Addington (*School of Architecture, Forestry & Environmental Studies*), Paul Anastas (*Forestry & Environmental Studies*), Gaboury Benoit (*Forestry & Environmental Studies*), Graeme Berlyn (*Forestry & Environmental Studies*), Ruth Blake (*Geology & Geophysics*), Garry Brewer (*Emeritus*) (*School of Management*), Derek Briggs (*Geology & Geophysics*), Gary Brudvig (*Chemistry, Molecular Biophysics & Biochemistry*), Benjamin Cashore (*Forestry & Environmental Studies*), Peter Crane (*Forestry & Environmental Studies*), Michael Donoghue (*Ecology & Evolutionary Biology, Forestry & Environmental Studies*), Michael Dove (*Forestry & Environmental Studies, Anthropology*), Menachem Elimelech (*Chemical & Environmental Engineering*), John Mack Faragher

(*History, American Studies*), Durland Fish (*Public Health, Forestry & Environmental Studies*), Thomas Graedel (*Forestry & Environmental Studies*), Daniel Kevles (*History, History of Medicine*), Benedict Kiernan (*History*), Robert Mendelsohn (*Forestry & Environmental Studies, Economics*), Alan Mikhail (*History*), Mark Pagani (*Geology & Geophysics*), Jeffrey Park (*Geology & Geophysics*), Peter Perdue (*History*), Linda Peterson (*English*), David Post (*Ecology & Evolutionary Biology*), Jeffrey Powell (*Ecology & Evolutionary Biology, Forestry & Environmental Studies*), Peter Raymond (*Forestry & Environmental Studies*), Nicholas Robinson (*Adjunct, Forestry & Environmental Studies*), Susan Rose-Ackerman (*Law School, Political Science*), 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*), John Wettlaufer (*Geology & Geophysics*), Robert Wyman (*Molecular, Cellular, & Developmental Biology*)

Associate Professors Paul Sabin (*History*), David Vasseur (*Ecology & Evolutionary Biology*), Julie Zimmerman (*Chemical & Environmental Engineering*)

Assistant Professors Mark Bradford (*Forestry & Environmental Studies*), Alex Felson (*Forestry & Environmental Studies*), Anjelica Gonzalez (*Biomedical Engineering*), Karen Hébert (*Forestry & Environmental Studies, Anthropology*), William Rankin (*History, History of Science*)

Senior Lecturers Shimon Anisfeld, Carol Carpenter, Amity Doolittle, John Grim, Fred Strebeigh

Lecturers Mary Beth Decker, Kealoha Freidenburg, Gordon Geballe, Paul Lussier, Linda Puth, Catherine Skinner, Carl Zimmer

Environmental Studies provides an interdisciplinary approach to understanding and solving environmental problems. From the natural sciences, students learn experimental techniques and methods of analysis needed to make accurate observations, to document change, to distinguish those changes resulting from human activity, and to understand what comprises healthy landscapes and functioning ecosystems. Students look to the humanities and social sciences for explanations of the ways people behave and for analyses of our institutions and their social, political, and economic activities. The Environmental Studies major prepares students for graduate study in a range of disciplines including law, medicine, and public health, and for careers in business, environmental management and conservation, teaching, and writing.

Prerequisites The major requires preparation in chemistry, biology, laboratory or field training, and either mathematics, physics, or statistics. The general chemistry prerequisite is fulfilled by a two-term lecture sequence in chemistry, or CHEM 118. The introductory biology prerequisite includes BIOL 101 and 102, or G&G 125, or MCDB 123. A natural science laboratory or field course focusing on research and

analytic methods is chosen from chemistry laboratories, EVST 221, 234L, 244, or G&G 126L. A term course in mathematics, physics, or statistics is selected from MATH 112 or above (excluding MATH 190), PHYS 170 or above, or STAT 101 or above. Students are advised to take chemistry and biology during the freshman year before enrolling in the EVST core courses in natural sciences. It is recommended that students complete the prerequisites by the end of the fall term in their sophomore year, prior to application to the major (see below), although this is not required. Where relevant, students may employ acceleration credit to fulfill the prerequisites.

Requirements of the major In addition to the prerequisites, twelve and one-half or thirteen and one-half course credits are required for the major, including four core courses, one core laboratory, a departmental seminar, a concentration of six courses, and a one- or two-term senior project and colloquium (EVST 496).

Credit/D/Fail courses Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

Core courses Students are required to take at least two core courses in the humanities and social sciences selected from EVST 120, 226, 255, 340, or 345. They must also take the environmental science core courses EVST 201, 202L, and 223. Completing one course in each area is recommended before the end of the sophomore year.

Departmental seminar All majors must complete a departmental seminar approved by the director of undergraduate studies. This requirement may be completed in any year of study. Seminars already approved include EVST 215, 285, and 290.

Area of concentration Students plan their concentration in consultation with the director of undergraduate studies and the student's adviser. A concentration is defined as six courses that provide depth in a problem or issue, as well as disciplinary expertise. Past concentrations have included biodiversity, climate change, energy, environmental history, food and agriculture, human health, resource use and sustainability, and urban planning. Students also have the opportunity to work with the director of undergraduate studies to design a unique concentration within the major.

Senior requirement Seniors must complete one or two terms of an independent research project and colloquium, taken as EVST 496. One-term senior essays require the permission of the director of undergraduate studies.

Application to the Environmental Studies major Students typically apply to enter the major during their sophomore year. Applications are accepted on a rolling basis throughout the year, and must be made in writing to the director of undergraduate studies; application details can be found on the program's Web site (<http://www.yale.edu/evst>). Juniors who have already completed considerable course work toward the major may also apply. Students considering a major in Environmental Studies should consult the director of undergraduate studies as early as possible in the freshman year.

Summer environmental internship During the summer between the junior and senior years, many students gain experience in the field through research or internships in an area pertinent to their senior research project. Internships may be arranged with

nonprofit organizations, government agencies, or corporations. Financial support may be available for students who wish to participate in the summer program.

REQUIREMENTS OF THE MAJOR

Prerequisites A 2-term lecture sequence in chem, or CHEM 118; BIOL 101 and 102, or G&G 125, or MCDB 123; a chem lab or EVST 221, 234L, 244, or G&G 126L; MATH 112 or above (excluding MATH 190), PHYS 170 or above, or STAT 101 or above

Number of courses 12½ or 13½ course credits beyond prereqs, incl one- or two-term senior project

Specific courses required EVST 201, 202L, 223; 2 from EVST 120, 226, 255, 340, 345

Distribution of courses 1 departmental sem, 6 courses in area of concentration

Senior requirement One- or two-term research project and colloq (EVST 496)

Introductory Courses

* **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 freshmen. Preregistration required; see under Freshman Seminar Program. WR

* **EVST 030b / ARCG 020b / CLCV 059b / HIST 020b / NELC 026b, Rivers and Civilization** Joseph Manning and 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. Includes a week-long field trip to Turkey. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU, SO

* **EVST 100a / APHY 100 / ENAS 100 / G&G 105 / PHYS 100, 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. Enrollment limited to 24. For application instructions, visit the course site on Classes*v2 (<http://classesv2.yale.edu>). QR, SC

EVST 102b / CHEM 102b / ENVE 202b, Introduction to Green Chemistry Paul Anastas
Overview of the basic concepts and methods needed to design processes and synthesize materials in an environmentally benign way. Related issues of global sustainability. Case studies that suggest possible solutions for the serious environmental and toxicological issues currently facing industry and society. Intended for non-science majors with a basic high school background in chemistry and physics, as well as high school algebra. Does not satisfy premedical chemistry requirements or requirements for the Chemistry major.

Core Courses

HUMANITIES AND SOCIAL SCIENCES

EVST 120b / AMST 163b / HIST 120b / HSHM 204b, Introduction to Environmental History Paul Sabin

Ways in which people have shaped and been shaped by the changing environments of North America from precolonial times to the present. Migration of species and trade in commodities; contrasting uses of land; the impact of industry and markets; the rise of modern conservation and environmental movements; the development of public policy; the global search for resources by the United States. HU

EVST 340b / ECON 330b, Economics of Natural Resources Robert Mendelsohn
Microeconomic theory brought to bear on current issues in natural resource policy. Topics include regulation of pollution, hazardous waste management, depletion of the world's forests and fisheries, wilderness and wildlife preservation, and energy planning. After introductory microeconomics. QR, SO

* **EVST 345a / ANTH 382a / F&ES 384a, Environmental Anthropology** Michael Dove
History of the anthropological study of the environment: nature-culture dichotomy, ecology and social organization, methodological debates, politics of the environment, and knowing the environment. SO

ENVIRONMENTAL SCIENCE

EVST 201a / G&G 140a, Atmosphere, Ocean, and Environmental 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. Must be taken concurrently with EVST 202L. QR, SC

* **EVST 202La / G&G 141La, Laboratory for Atmosphere, Ocean, and Environmental Change** Ronald Smith

Laboratory and field exercises to accompany EVST 201. Must be taken concurrently with EVST 201. SC ½ Course cr

EVST 223a / E&EB 220a, General Ecology Ann Staver and David Vasseur
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 191a, Trees: Environmental Biology and Global Significance Craig Brodersen
Underlying principles that govern tree biology in both time and space. The biophysics of energy balance, water transport, and gas exchange, from individual plant organs

to the tree and forest canopy; principles of cells and membranes; the fundamental differences between plant and animal cells; regional and global patterns in forest dynamics; implications of disruptions in the biotic and abiotic environment. Case studies focus on understanding forests and forest products and their global significance.

SC

*** EVST 200b / G&G 115b, Earth System Science** Jeffrey Park

A survey of geoscience. Interaction of lithosphere, hydrosphere, atmosphere, and Earth's deep interior; natural controls on environment and climate in past, present, and future; rocks, minerals, glaciers, earthquakes, and volcanoes; natural hazards and natural resources. (Formerly G&G 200) SC

EVST 211b / G&G 211b / HIST 143b / HSHM 211b, Catastrophe and the Earth Sciences since 1850 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. SO

*** EVST 221a / E&EB 230a / F&ES 221a, Field Ecology** Linda Puth

A field-based introduction to ecological research, using experimental and descriptive approaches, comparative analysis, and modeling for field and small-group projects. Weekly field trips explore local lake, salt marsh, rocky intertidal, traprock ridge, and upland forest ecosystems. Includes one Saturday field trip and a three-day trip during the October recess. Concurrently with or after E&EB 220 or with permission of instructor. 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 258a / AMST 258a, Wilderness in the North American Imagination** Michelle Morgan

The idea of wilderness in American history, art, film, public policy, and literature, from the Puritans to the present. Authors include Thoreau, Faulkner, Jack London, Mary Rowlandson, Aldo Leopold, and Rachel Carson. A weekend field trip is held early in 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 292a, Sustainability in the Twenty-First Century Daniel Esty

Sustainability as an overarching framework for life in the twenty-first century. Ways in which this integrated policy concept diverges from the approaches to environmental protection and economic development that were pursued in the twentieth century. The interlocking challenges that stem from society's simultaneous desires for economic, environmental, and social progress despite the tensions across these realms. SO

* **EVST 311a, Environmental Communication for Public Engagement & Policy** Paul Lussier

Analysis, assessment, and application of narrative strategies to the communication of climate and energy science toward public policy engagement and action. Emerging interdisciplinary theory and research in narratology, sociology, and psychology, as well as cultural, education, and media sciences. Recommended preparation: CSES 310. SO

* **EVST 321b / ANTH 320b / ARCG 320b / NELC 320, From Babylon to Bush** Harvey Weiss

Analysis of Mesopotamian transformations from the earliest agriculture villages to the earliest cities, states, and civilization, to the earliest empires, as well as the region-wide collapses that punctuated these developments. Forces that drove these uniquely early Mesopotamian developments. Essential archaeological questions, including why each transformation happened, developed, and evolved. The end of the Ottoman empire and the British (1917) and American (1991, 2003) invasions. HU, SO

* **EVST 325a / ENGL 248a, Nature Writing in Britain and the English-Speaking World** Linda Peterson

Natural history and environmental writing in the English-speaking world from the late eighteenth century to the present. Readings include Gilbert White's *Natural History of Selborne*, Thoreau's *Walden*, and Darwin's *Voyage of the Beagle*, as well as recent work by writers from Canada, the United States, India, and South Africa. Pre-1900 with permission of instructor. WR, HU

* **EVST 348b, Yellowstone and Global Change** Susan Clark

Introduction to sustainability issues in natural resource management and policy, using the Greater Yellowstone ecosystem as a case study. Topics include large carnivores, wildlife conservation, parks, energy, and transportation. Priority to Environmental Studies majors.

* **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 399a, Agriculture: Origins, Evolution, Crises** Harvey Weiss

Analysis of the societal and environmental drivers and effects of plant and animal domestication, the intensification of agroproduction, and the crises of agroproduction:

land degradation, societal collapses, sociopolitical transformation, sustainability, and biodiversity. SO

* **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 473b / ANTH 473b / ARCG 473b, Abrupt Climate Change and Societal Collapse** Harvey Weiss

The coincidence of societal collapses throughout history with decadal and century-scale drought events. Challenges to anthropological and historical paradigms of cultural adaptation and resilience. Examination of archaeological and historical records and high-resolution sets of paleoclimate proxies. HU, SO

Departmental Seminars

* **EVST 215a / ENGL 459a, Writing about Science and the Environment** Carl Zimmer

An intensive workshop in writing about science and the environment for a broad audience. Translating complex subjects into elegant prose, conducting interviews, handling controversies, researching articles, and finding one's voice. Readings include exemplary works ranging from newspaper articles to book excerpts. Admission by application only. Application details and forms are available at english.yale.edu/undergraduate/applications-and-deadlines. WR RP

Senior Project

* **EVST 496a or b, Senior Research Project and Colloquium** Jeffrey Park, Amity Doolittle, and Paul Sabin

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: Andrew March, 31 Hillhouse Ave., 432-7178,
andrew.march@yale.edu; epe.yale.edu

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 (*Political Science*), Andrew Sabl (*Visiting*), Nicholas Sambanis (*Director*) (*Political Science*), Ian Shapiro (*Political Science*), Peter Swenson (*Political Science*), Steven Wilkinson (*Political Science*)

Associate Professor Andrew March (*Political Science*)

Senior Lecturers Boris Kapustin, Ioannis Kessides (*Visiting*)

Lecturers Alexandra Dufresne (*Political Science*), Stephen Latham (*Political Science*), Vikram Mansharamani (*Global Affairs*)

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 Fourteen term courses are required for the major, including five introductory courses, one intermediate microeconomics course, three core courses, one advanced seminar, and four courses comprising a student's individual area of concentration. The concentration is developed in consultation with the director of undergraduate studies 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 and to assess policies with complex social, economic, and moral implications.

The five introductory courses include two in economics (microeconomics and macroeconomics), one in political philosophy, one in ethics, and one in statistics. An intermediate course in microeconomics is also required.

Core courses Three core courses comprise the center of the major in Ethics, Politics, and Economics. The first core course, required for all majors, is EP&E 215, Classics of Ethics, Politics, and Economics. Students must complete two additional core courses, each selected from a different one of the following three groups: rationality and social choice, political systems, and social theory and cultural analysis. The three core courses must be taken before the senior year. Core courses are indicated by the designations "Rationality Core," "PoliticalSystems Core," and "Social Theory Core" in the course listings in this bulletin and are listed by group on the program's Web site (<http://epe.yale.edu/undergraduate-information/requirements-major/#corereq>).

Advanced seminars All majors must complete one advanced seminar. The course is selected from an approved group of seminars that focus on how core modes of reasoning drawn from the major's three areas of inquiry can be applied to a particular area or problem. Courses that fulfill the advanced seminar requirement are indicated by the designation "Advanced Seminar" in the course listings in this bulletin and are listed by group on the program's Web site (<http://epe.yale.edu/undergraduate-information/requirements-major/#corereq>).

Area of concentration Each student defines an area of concentration in consultation with the director of undergraduate studies. 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 essay" below). In designing the area of concentration, students are encouraged to include seminars from other departments and programs. The director of undergraduate studies 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; civil society and its normative implications.

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 Courses in the Yale Graduate and Professional Schools (p. 70) in the Academic Regulations.

Senior essay 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 director of undergraduate studies. 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 director of undergraduate studies 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.

Senior essays written in the fall term are due December 7, 2015. Senior essays written in the spring term and yearlong essays are due April 11, 2016. One-term essays are normally expected to be forty to fifty pages in length; yearlong essays are normally expected to be eighty to one hundred pages in length.

Credit/D/Fail Students admitted to the major may take any 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.

Application to the Ethics, Politics, and Economics major Students must apply to enter the major at the end of the fall term of their sophomore year. Applications must be submitted via e-mail to the program's registrar at kellianne.farnham@yale.edu no later than 4 p.m. on Friday, December 4, 2015. Applications must include the application cover sheet, a transcript of work at Yale that indicates fall-term 2015 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's Web site (<http://epc.yale.edu/undergraduate-information/applying-major>).

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 14 (incl senior req)

Specific course required EP&E 215

Distribution of courses 1 intro course each in microeconomics, macroeconomics, political phil, ethics, and stat; 1 intermediate microeconomics course; 2 adttl core courses, as specified; 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 a sem or in EP&E 491 or in EP&E 492 and 493)

EP&E 203a / PLSC 452a / STAT 102a, Introduction to Statistics: Political Science
Staff

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: Intro Statistics

EP&E 204a / ENAS 335a, Professional Ethics Mercedes Carreras

A theoretical and case-oriented approach to ethical decision making. Concepts, tools, and methods for constructing and justifying solutions to moral problems that students may face as professionals. SO

EP&E 209a / PLSC 453a / STAT 103a, Introduction to Statistics: Social Sciences Staff

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: Intro Statistics

* **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 221b / ECON 457b, Economics, Politics, and History: Institutional Design and Institutional Change** Jose-Antonio Espin-Sanchez

The efficiency and distributive consequences of institutions' governing of human relationships. Efficiency concerns with the size of the "pie"; ways in which different institutions generate a bigger "pie" than others. Distribution concerns with who gets a bigger piece of the "pie." Why "bad" institutions persist over time; what can be done to change from bad/old institutions to good/new institutions. Prerequisites: intermediate micro- or macroeconomics, and a course in statistics and probability. SO

* **EP&E 224a / ECON 465a / GLBL 330a, Debating Globalization** Ernesto Zedillo

Facets of contemporary economic globalization, including trade, investment, and migration. Challenges and threats of globalization: inclusion and inequality, emerging global players, global governance, climate change, and nuclear weapons proliferation. Prerequisite: background in international economics and data analysis. Preference to seniors majoring in Economics or EP&E. SO RP

EP&E: Rationality Core

* **EP&E 227b / ECON 473b / PLSC 343b, Equality** John Roemer

Egalitarian theories of justice and their critics. Readings in philosophy are paired with analytic methods from economics. Topics include Rawlsian justice, utilitarianism, the veil of ignorance, Dworkin's resource egalitarianism, Roemer's equality of opportunity, Marxian exploitation, and Nozickian procedural justice. Some discussion of American economic inequality, Nordic social democracy, and the politics of inequality. Recommended preparation: intermediate microeconomics. SO

EP&E: Rationality Core

* **EP&E 228b / ECON 462b / GLBL 316b / LAST 410b, The Economics of Human Capital in Latin America** Douglas McKee

Economic issues related to a population's education, skills, and health; focus on contemporary Latin American societies. Determinants of health and education; evaluation of human capital development policies; the role of human capital in a variety of economic contexts, including the labor market, immigration, child investment, intrahousehold bargaining, inequality, and poverty. Prerequisites: intermediate microeconomics and econometrics. SO

EP&E: Rationality Core

* **EP&E 230a / PLSC 310a, Self-Interest and Its Critics** Andrew Sabl

Debates surrounding the concept of self-interest from the seventeenth century to the present. Defining self-interest, its nature, and its limits, and distinguishing it from other motives for behavior; advantages and disadvantages of assuming self-interested motives for human actions; current scholarship on economic rationality, rational choice in political science, and philosophical ethics. SO

* **EP&E 235b / PHIL 457b / PLSC 283b, 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: Rationality Core

* **EP&E 236b / PLSC 466b, Ethics and the Multinational Business Firm** Susan

Rose-Ackerman

Ethical challenges facing modern business leaders, with a focus on multinational corporations conducting business in developing countries. Topics include the normative basis of the market and firm, labor rights, environmental harms, corruption and fraud, and obligations of managers to shareholders and to other stakeholders. Priority to junior and senior majors in Ethics, Politics, and Economics. SO

EP&E: Rationality Core

* **EP&E 238a / PLSC 340a, Leadership, Coordination, and Focal Points** Andrew Sabl

Analysis of a leadership model in which the leader's role is both the coordination of mutually beneficial action among multiple parties and the appeal to focal points, understood as natural or obvious meeting points for communication or action. Basic concepts of coordination and focal points; the ability of leaders to exert power by creating new focal points, choosing among existing ones, or serving as focal or rallying points themselves; constitutionalism as a solution to coordination problems. SO

EP&E: Rationality Core

* **EP&E 240a / GLBL 333a / PLSC 428a, Comparative Welfare Policy in Developing Countries** Jeremy Seekings

Examination of public and private welfare systems in the developing world. Analysis of the evolving relationships between kin or community and states and market. Particular attention to the politics of contemporary reforms. SO

* **EP&E 242a / PLSC 372a, Politics and Markets** Peter Swenson

Examination of the interplay between market and political processes in different substantive realms, time periods, and countries. Inquiry into the developmental relationship between capitalism and democracy, including the developmental and

functional relationships between the two. Investigation of the politics of regulation in areas such as property rights, social security, international finance, and product, labor, and service markets. Topics include the economic motives of interest groups and coalitions in the political process. SO

EP&E: PoliticalSystems Core

* **EP&E 243b / GLBL 336b / LAST 423b / PLSC 423b, 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 244a / AFAM 273a / SOCY 314a / WGSS 316a, Inequality in America** Vida Maralani

Introduction to the current landscape of socioeconomic inequality in the U.S. Empirical, theoretical, and methodological facets of inequalities in education, occupation, income, wealth, health, neighborhoods, and intergenerational mobility; how these intersect with race and gender. Core questions include how different social groups fare and why, and what types of policies might address existing inequalities. WR, SO

* **EP&E 245a / PLSC 152a, Global Firms and National Governments** Joseph LaPalombara

The type and magnitude of foreign direct investments made by a relatively small number of large firms, and the political influence such firms exercise. Complex challenges raised by powerful global firms emerging from once-dependent and less-developed countries such as China, India, and Brazil. Discussion of the present and probable future relationships between economic and governmental organizations that result from the processes of globalization. Case studies illustrate specific problems faced by both corporate leaders and national and subnational public-policy officials. SO

EP&E: PoliticalSystems Core

* **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. SO

EP&E: PoliticalSystems Core

* **EP&E 249b / PLSC 377b / RLST 288b, Islam and Democracy in the Modern Middle East** Andrew March

The development of regimes of government in Muslim countries since the nineteenth century. Early constitutional movements, the rise of political Islam, the management of religion in various twentieth-century states, the Iranian revolution, and the growth of Salafi ideas, culminating in the ISIS "caliphate." 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: PoliticalSystems Core

* **EP&E 257a / PLSC 399a, Politics in Latin America** Ana De La O

Overview and analysis of politics in Latin America. The emergence of democracy and the forces that led to the unprecedented increase in inequality in the twentieth century. Topics include institutional design, historical legacies, corruption, clientelism, and violence.

* **EP&E 258b / PLSC 446b / SOCY 369b, Welfare States across Nations** Sigrun Kahl

How different societies counterbalance capitalism and deal with social risks. Welfare state regimes and their approaches to inequality, unemployment, poverty, illness, disability, child rearing, and old age. Why the United States has an exceptionally small welfare state. SO

EP&E: PoliticalSystems Core

* **EP&E 259b / PLSC 183b, Europe, the United States, and the Iraq Crisis** Jolyon Howorth

Examination of the contrasting relations between the main European powers and the United States in their approaches to Iraq in order to understand the divisions attending the 2003 war and the subsequent transfer of sovereignty. Topics include the Iran-Iraq War (1980–88), the first Persian Gulf crisis (1990–91), the sanctions regime (1991–2002), problems of peacekeeping and nation building, and the Obama exit strategy. SO

EP&E: PoliticalSystems Core

* **EP&E 267b / SOCY 216b / WGSS 314b, Social Movements** Ron Eyerman

An introduction to sociological perspectives on social movements and collective action, exploring civil rights, student movements, global justice, nationalism, and radical fundamentalism. SO

EP&E: Social Theory Core

* **EP&E 271b / AFST 447b / ER&M 271b / PLSC 447b, The Rwandan Genocide in Comparative Context** David Simon

An examination of the 1994 Rwandan genocide: historical sources of the conflict, the motivations of the killers, actions and reactions of outside actors, efforts to reconstruct a post-genocide society, and continuation of the genocidal dynamic within the Great Lakes region. Consideration of other countries in similar situations, as well as other genocides in recent decades. SO

EP&E: Social Theory Core

* **EP&E 276a / PHIL 463a / PLSC 292a, Rethinking Sovereignty, Human Rights, and Globalization** Seyla Benhabib

Discussion of the crises of sovereignty and the end of sovereignty. Postnationalist, cosmopolitan, and neoliberal criticisms of sovereignty. Traditional models of sovereignty compared with cosmopolitan alternatives; implications of these models for the definition and enforcement of rights. Readings include works by Hobbes, Kant, Rousseau, Austin, Schmitt, Kelsen, Habermas, Waldron, Pogge, Sassen, and Aleinikoff.

SO

* **EP&E 280b / PLSC 301b, Ancient Greek Political Development** Staff

Varieties of political experience in the ancient Greek world during the archaic, classical, and hellenistic periods. Attention to different regime types, places, political forms, institutions, and persons. SO

* **EP&E 285b / PLSC 122b, Humanitarian Intervention** Jolyon Howorth

Analysis of Western intervention in humanitarian crises since the end of the Cold War. Case studies from Kurdistan, Somalia, Bosnia-Herzegovina, Kosovo, Ivory Coast, Libya, and Mali. Reasons for nonintervention in Rwanda, Darfur, and Syria. Ethics of the humanitarian dimension; politics of coalitions of the willing; the material dimension of interest; the effectiveness of humanitarian intervention in achieving its stated objectives. SO

EP&E: Political Systems Core

* **EP&E 286b / ECON 475b, 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: Political Systems Core

* **EP&E 289a / PLSC 308a, Beyond Representative Government** Hélène Landemore

Institutional innovations that aim to reform or replace the political system of representative government in the twenty-first century. Governments' efforts to reform their own modes of functioning; grassroots movements for citizens' self-rule; emerging principles behind these new forms of governance; ways in which these forms differ from both representative government and direct democracy. Attention to empirical and normative perspectives. SO

* **EP&E 294b / GLBL 338b / PLSC 457b, Social Welfare and Nongovernmental Organizations** Katharine Baldwin

The role of nonstate actors such as religious organizations, community associations, and international NGOs in the delivery of basic goods and services in developing countries. Welfare states in Europe and North America and reasons why states outside these regions have not developed similar institutions; causes of and logic behind various nonstate actors' involvement in social welfare provision; economic, institutional, and political effects of having nonstate actors provide social services and public goods. SO

* **EP&E 297b / ECON 471b, Topics in Cooperative Game Theory** Pradeep Dubey

The theory and applications of cooperative games. Topics include matching, bargaining, cost allocation, market games, voting games, and games on networks. Prerequisite: intermediate microeconomics.

* **EP&E 298a / ECON 481a, Empirical Microeconomics** Jessica Reyes

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 300b / ECON 452b / GLBL 302b, Contemporary Issues in Energy Policy**

Ioannis Kessides

Overview of challenges in the global energy framework generated by concerns about energy security and climate change; public policies necessary for addressing these issues. Potential contributions and limitations of existing, improved or transitional, and advanced technologies. SO

EP&E: Advanced Seminar

* **EP&E 310a / PLSC 227a, Refugee Law and Policy** Alexandra Dufresne

Controversies and challenges in U.S. and international refugee law and policy, with a focus on asylum law and practice in the United States. Emphasis on legal reasoning and analysis through close reading of statutes, regulations, and case law. Final project is a legal brief on behalf of a client. SO

EP&E: Advanced Seminar

* **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: Advanced Seminar

* **EP&E 324a / PLSC 244a, 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 334a / PHIL 455a, 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: Advanced Seminar

* **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: Advanced Seminar

* **EP&E 365a / AFST 360a / ECON 487a / GLBL 313a / PLSC 417a, The Political Economy of AIDS in Africa** Nicoli Natrass

The impact of and responses to the AIDS pandemic in Africa examined from a comparative perspective. Focus on South and southern Africa. Some background in social science and economics desirable. 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: Advanced Seminar
- * **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. SO
EP&E: Advanced Seminar
- * **EP&E 410b / PLSC 304b, Business Ethics** Vikram Mansharamani
Current ethical problems facing business leaders. Visible and invisible factors that make ethical decisions complex and difficult to analyze. Anticipating ethical dilemmas; framing decisions and gathering information; the difficulties of taking appropriate, timely action.
EP&E: Advanced Seminar
- * **EP&E 411a / PLSC 287a, Democracy and Distribution** Ian Shapiro
An examination of relations between democracy and the distribution of income and wealth. Focus on ways in which different classes and coalitions affect, and are affected by, democratic distributive politics. Open to juniors and seniors. SO
EP&E: Advanced Seminar
- * **EP&E 426b / ARCH 347b / PLSC 250b, Infrastructure: Politics and Design** Elihu Rubin
Infrastructures—the physical frameworks for human settlement, urbanization, and social life, including networks for transportation, water, energy, and communication. Current debates on infrastructure spending in the context of historical investments in the modern American city. SO
- * **EP&E 466a / PLSC 202a, Children's Law and Policy** Alexandra Dufresne
Major themes and controversies in children's law and policy in the United States. Topics include juvenile justice, child abuse and neglect, special education, and the rights of immigrant and refugee children. Development of skills in legal reasoning, analysis, and policy design. Priority to junior and senior majors in Ethics, Politics, and Economics and in Political Science. SO
EP&E: Advanced Seminar
- * **EP&E 470a / ECON 469a / GLOBL 325a, Health Inequality and Development** Staff
Economic analysis of the interactions between health, inequality, and development. Growth and development; health and well-being; burden of disease and funding for health; the relationship between growth and health; international health policy. Prerequisite: introductory microeconomics and macroeconomics. SO
- * **EP&E 471a or b, Directed Reading and Research** Andrew March
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 472a / PLSC 349a, Ethnic Conflict** Nicholas Sambanis

Study of ethnic conflict, focusing on violent forms such as civil wars. Dominant explanations of ethnic conflict; historical case material, policy reports, and news articles from Bosnia, Rwanda, Iraq, Afghanistan, and Syria; analysis of data on ethnic conflict that spans more than fifty years; research from the fields of political science, economics, sociology, and anthropology. Recommended preparation: introductory courses in political science and economics. SO

* **EP&E 477a / SOCY 321a, Sociology of Markets** Frederick Wherry

The role of culture and politics in shaping markets. Links between social networks and employment discrimination, religion and wealth, social relationships and financial troubles, and culture and industry. The moral dimensions of selling organs and intimacy. WR, SO

* **EP&E 481a / PLSC 442a / SAST 341a, Development in South Asia** Tariq Thachil

Introduction to issues surrounding political and economic development in South Asia. Successes and failures of modernization, including the influence of intellectual trends and their derivative policy prescriptions. Foundational perspectives on development and the policies they yielded; empirical treatments of the experiences of South Asian countries in the postcolonial era. SO

* **EP&E 482b / ECON 484b, Political Economy: Separatism and Annexation** Eric Weese

Formal political-economy models of jurisdiction formation, with a focus on changes in national and subnational boundaries. Application of models to issues such as problematic colonial boundaries in Africa, the apparent success of very small countries, and the role of democracy in recent municipal amalgamations in Canada and Japan. Prerequisites: econometrics and intermediate micro- and macroeconomics.

* **EP&E 484a / AFST 347a / GLBL 243a / LAST 348a / PLSC 347a, Post-Conflict Politics** David Simon

Consideration of a range of issues and challenges faced by countries emerging from domestic conflict. Focus on elements of peace-building—disarmament and demobilization, post-conflict elections, institution-building, and reconstruction—as well as modes of transitional justice and mechanisms for truth and reconciliation. SO

* **EP&E 491a or b, The Senior Essay** Andrew March

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** Andrew March

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.

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

EP&E: Intro Ethics

PLSC 114a, Introduction to Political Philosophy Bryan Garsten

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

EP&E: Intro Political Phil

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

EP&E: Intro Political Phil

Ethnicity, Race, and Migration

Director of undergraduate studies: to be announced, Rm. 204, 35 Broadway, 432-5116, erm@yale.edu; erm.yale.edu

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*), Jonathan Holloway (*History, African American Studies*), Matthew Jacobson (*American Studies, African American Studies, History*), Gilbert Joseph (*History*), Mary Lui (*American Studies, History*), Stephen Pitti (*History, American Studies*), Alicia Schmidt Camacho (*American Studies*), Jing Tsu (*East Asian Languages & Literatures*)

Associate Professors Jafari Allen (*Anthropology, African American Studies*), Zareena Grewal (*American Studies*), Daniel Magaziner (*History*)

Assistant Professors Rene Almeling (*Sociology*), Laura Barraclough (*American Studies*), Albert Laguna (*American Studies, Ethnicity, Race, & Migration*), Vida Maralani (*Sociology*), Dixa Ramirez (*American Studies, Ethnicity, Race, & Migration*), Birgit Brander Rasmussen (*American Studies*)

Lecturers Jasmina Besirevic-Regan (*Sociology*), David Simon (*Political Science*)

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.

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.

Requirements of the major 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 2015–2016 ER&M 200 will not be offered, and students should consult the director of undergraduate studies about options for a substitute course. 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.

Distributional requirements In order to acquire a comparative sense of ethnicity, race, and migration, students are expected to take at least two courses in each of two distinct geographic areas. To gain familiarity with global movements of people within and across national borders, majors must take at least one course that examines historical or contemporary migrations. Students must also demonstrate evidence of interdisciplinary work related to ethnicity, race, and migration in at least two departments or academic fields.

Area of concentration In consultation with the director of undergraduate studies, each student defines an area of concentration consisting of five term courses, not including the senior essay or project. Advanced work in the foreign language related to a student's area of concentration is advised. Courses applied toward the area of concentration may also be used to fulfill the major's distributional requirements.

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.

Senior requirement The senior requirement has two components. In the fall term, all majors take the senior colloquium (ER&M 491) on theoretical and methodological issues. Students may choose to complete the requirement by writing a senior essay in the senior project seminar (ER&M 492) during the spring term. Alternatively, students

may take an upper-level ER&M seminar and write a senior essay of thirty to thirty-five pages in addition to completing all course requirements. This seminar may be taken during either the fall or spring term. Majors planning to undertake an independent senior project must submit a proposal signed and approved by a faculty adviser to the director of undergraduate studies during the fall term.

Term 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 director of undergraduate studies 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 5 courses in area of concentration; at least 2 courses in each of 2 geographic areas; at least 1 course on historical or contemporary migrations; at least 2 interdisciplinary courses from different departments or fields

Senior requirement Senior colloq (ER&M 491); senior essay or project in upper-level sem or in ER&M 492

Required Courses

[ER&M 200, Introduction to Ethnicity, Race, and Migration]

* **ER&M 300b, Comparative Ethnic Studies** Birgit Rasmussen

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 060b / AMST 060b / HIST 016b, Significance of American Slavery** Edward Rugemer

The history of American slavery, its destruction during the nineteenth century, and its significance today. Topics include the origins of slavery, the development of racism, the transatlantic slave trade, the experience of enslavement, resistance to slavery, the abolitionist movement, the process of emancipation, and the perpetuation of slavery and other forms of unfree labor in the twenty-first century. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

AFAM 162a / AMST 162a / HIST 187a, African American History from Emancipation to the Present Jonathan Holloway

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 346a / HSAR 471a, Black Atlantic Photography** Kobena Mercer

Introduction to the social and artistic history of photography in Black Atlantic contexts from the mid-nineteenth century to the present. Uses of the photographic image in shaping understandings of race relations and black identities. Codes and conventions by which photographs are evaluated in terms of truth, reflection, testimony, expressivity, and construction. HU

* **AFAM 377a / AMST 359a / FILM 424a, Urban Narratives of Injustice in *The Wire***
Hazel Carby

Narratives of injustice, crime, and the policing of citizens as represented in *The Wire*, critically acclaimed as the finest television drama ever made, plus additional readings. HU

* **AFAM 410b / AMST 310b / WGSS 410b, Interdisciplinary Approaches to African American Studies** Jafari Allen

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 161a / AFAM 110a, Freedom and Identity in Black Cultures Jafari Allen

Introduction to major themes and topics in African American experiences; basic methods of interdisciplinary analysis and interpretation in African American studies. Topics include black economic, political, and social institutions; self-identity and social status; literature, art, film, and music; and political and social issues and their relationship to changing social structures. HU, SO

* **AMST 296a / AFAM 296a / ENGL 296a / WGSS 292a, Contemporary African American Literature** Elizabeth Alexander

A survey of African American literature since 1970. Authors include Toni Morrison, Alice Walker, Rita Dove, Yusef Komunyakaa, Anna Deavere Smith, Danzy Senna, and others. Topics include black feminist literature, black gay and lesbian literature, developments in literary criticism and theory, and contemporary black drama. HU

* **AMST 307b, Sports, Civil Rights, and American Leadership** Joseph Spooner

Relations among sports, civil rights movements, and the evolution of American leadership values in the twentieth century. The American sports hero and the struggle for equality of race, gender, and sexual orientation; the cultural effects of major sports phenomena on ideas of leadership and social change. Attention to intellectual and cultural history, literature, and film. Case studies based on key sporting figures and events.

* **AMST 410b / WGSS 409b, 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 254a, Japan: Culture, Society, Modernity William Kelly

Introduction to Japanese society and culture. The historical development of Japanese society; family, work, and education in contemporary Japan; Japanese aesthetics; and psychological, sociological, and cultural interpretations of Japanese behavior. WR, SO

Anthropology: Sociocultural

*** ANTH 302a / AMST 402a / FILM 324a / WGSS 380a, Gender and Sexuality in Media and Popular Culture** Vanessa Agard-Jones and Laura Wexler

Investigation of visual media and popular culture in the United States and transnationally. Gender, race, class, and sexuality in relation to the production, circulation, consumption, and reception of media culture. Focus on theories of media and the visual. Significant lab component in which students use media technologies to make and illustrate theoretical arguments. HU

Anthropology: Sociocultural

*** ANTH 333a, Bilingualism in Social Context** J. Joseph Errington

The linguistic phenomenon of bilingualism presented through broad issues in social description inseparably linked to it: growth and change in bilingual communities; bilingual usage, social identity, and allegiance; and interactional significances of bilingual speech repertoire use. SO

Anthropology: Linguistic

*** ANTH 366b / AMST 435b, Anthropology of 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

Anthropology: Sociocultural

*** ANTH 386b / GLOB 393b, Humanitarian Interventions: Ethics, Politics, and Health**
Catherine Panter-Brick

Analysis of humanitarian interventions from a variety of social science disciplinary perspectives. Issues related to policy, legal protection, health care, morality, and governance in relation to the moral imperative to save lives in conditions of extreme adversity. Promotion of dialogue between social scientists and humanitarian practitioners. SO

Anthropology: Sociocultural

*** ANTH 438b, Culture, Power, Oil** Douglas Rogers

The production, circulation, and consumption of petroleum as they relate to globalization, empire, cultural performance, natural resource extraction, and the nature of the state. Case studies include the United States, Saudi Arabia, Nigeria, Venezuela, and the former Soviet Union. SO

Anthropology: Sociocultural

ER&M 187a / AMST 133a / HIST 107a, Introduction to American Indian History

Ned Blackhawk

Survey of American Indian history, beginning with creation traditions and migration theories and continuing to the present day. Focus on American Indian nations whose homelands are located within the contemporary United States. Complexity and change within American Indian societies, with emphasis on creative adaptations to changing historical circumstances. WR, HU

ER&M 210b / AFAM 140b / AMST 211b / ENGL 293b / WGSS 211b, Race and Gender in American Literature Birgit Rasmussen

The role of literature in constructing representations of America as an idea, a nation, a colonial settlement, and a participant in world affairs. What kind of place America is and who belongs there; the consequences of America's history for its national literature. Emphasis on the ways texts represent and contest social concepts of race and gender difference. WR, HU

ER&M 217b / AMST 284b, Introduction to Latino/a Studies Albert Laguna

Themes and issues that have shaped the experiences of Latino/a populations in the United States explored within an interdisciplinary and hemispheric framework. Relations between the United States and Latin America; the history of ethnic labels; the formation of transnational communities and identities; the politics of language and bilingualism; race, class, and ethnicity; and gender and sexuality. HU

ER&M 219a / HIST 219a / JDST 200a / MMES 149a / RLST 148a, Jewish History and Thought to Early Modern Times Ivan Marcus

A broad introduction to the history of the Jews from biblical beginnings until the European Reformation and the Ottoman Empire. Focus on the formative period of classical rabbinic Judaism and on the symbiotic relationships among Jews, Christians, and Muslims. Jewish society and culture in its biblical, rabbinic, and medieval settings. Counts toward either European or non-Western distributional credit within the History major, upon application to the director of undergraduate studies. HU RP

ER&M 236a / ENGL 344a, Global Fictions Justin Neuman

Survey of literary fiction from the late nineteenth century to the present in which globalization serves as a major theme and primary frame of reference. Vectors of globalization include energy, transportation, capital, drugs, war, media, tourism, and sexuality. HU

*** ER&M 270b / HIST 358Jb / LAST 356b, History of Mexico since Independence**
Gilbert Joseph

Modern Mexico from the wars of independence in the early nineteenth century to the present. Social, cultural, and economic trends and their relationship to political movements; particular emphasis on the Revolution of 1910 and the long shadow it has cast, and on patterns of relations with the United States. WR, HU

*** ER&M 271b / AFST 447b / EP&E 271b / PLSC 447b, The Rwandan Genocide in Comparative Context** David Simon

An examination of the 1994 Rwandan genocide: historical sources of the conflict, the motivations of the killers, actions and reactions of outside actors, efforts to reconstruct a post-genocide society, and continuation of the genocidal dynamic within the Great Lakes region. Consideration of other countries in similar situations, as well as other genocides in recent decades. SO

ER&M 282a / AMST 272a / HIST 183a / WGSS 272a, Asian American History, 1800 to the Present Mary Lui

An introduction to the history of East, South, and Southeast Asian migrations and settlement to the United States from the late eighteenth century to the present. Major themes include labor migration, community formation, U.S. imperialism, legal exclusion, racial segregation, gender and sexuality, cultural representations, and political resistance. HU

* **ER&M 312b / PLSC 312b, Migration, Noncitizenship, and Justice** Staff

This course introduces students to some of the main texts and key themes relating to migration and noncitizenship justice. Migration, as the movement of persons is an important aspect of human experience and it has been a creator and challenger of politics and political systems. Noncitizenship, as the state of not being a political member of a country, particularly the country in which one finds oneself, is an important corollary of the existence of citizenship and is often related closely to migration. SO

ER&M 313b / AFST 180b, Nigeria and Its Diaspora Oluseye Adesola

Nigerians in the modern diaspora, both those who endured forced migration and those who migrated voluntarily. Specific reference to the Igbos and the Yorùbás. The preservation and maintenance of Nigerian culture, history, dance, literature, traditional education, theater, politics, art, music, film, religion, and folklore, especially in African American and Nigerian American contexts. SO

* **ER&M 327b / MMES 311b / WGSS 327b, Constructing the Self: From Autobiography to Facebook** Geetanjali Chanda

Autobiography in its evolving form as literary genre, historical archive, and individual and community narrative in a changing geographical context. Women's life stories from Afghanistan, China, Cambodia, Indonesia, India, Iran, Egypt, Jordan, and Vietnam illustrate the dialectic relationship between the global and the local. What the reading and writing of autobiographies reveal about oneself and one's place in society; autobiography as a horizontal community formation. WR, HU

* **ER&M 328b / SAST 458b / WGSS 328b, Popular Culture and Postcolonial India**
Geetanjali Chanda

A study of films and literature of South Asians living, working, and directing in Canada, the United Kingdom, and the United States. Questions of commercial populism, authenticity, and postcolonial identity. WR

* **ER&M 332b / ENGL 334b, Postcolonial World Literatures, 1945 to the Present** Staff

Introduction to key debates about postwar world literatures in English, to the politics of English as a language of postcolonial literature, and to debates about globalization and culture. Themes include colonial history, postcolonial migration, translation, national identity, cosmopolitanism, and global literary prizes. WR, 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 354b / ENGL 352b, Asian American Literature** Staff

A study of how literature services, reflects, and contradicts the political formation "Asian American." The role of literature in the Asian American movement of the 1960s and 1970s; representations of literariness in contemporary Asian American novels, poems, and plays. WR, HU

* **ER&M 360b / HLTH 370b / HSHM 432b / SOCY 390b / WGSS 390b, Politics of Reproduction** Rene Almeling

Reproduction as a process that is simultaneously biological and social, involving male and female bodies, family formation, and powerful social institutions such as medicine, law, and the marketplace. Sociological research on reproductive topics such as pregnancy, birth, abortion, contraception, infertility, reproductive technology, and aging. Core sociological concepts used to examine how the politics of reproduction are shaped by the intersecting inequalities of gender, race, class, and sexuality. WR, SO

* **ER&M 370b / AMST 441b / HIST 130Jb, 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 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

* **ER&M 435a / AMST 422a / HIST 151Ja, 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 / ENGL 479a / THST 437a, Playwriting Workshop: Adaptation, 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

* **HIST 018a / AMST 019a, Commodities as U.S. History** Matthew Jacobson

American social, cultural, and political history introduced through study of the production, distribution, and consumption of common commodities. Topics include political economy, slavery, industrialization, labor, the rise of the corporation, the growth of the administrative and regulatory state, geopolitics, foreign policy, and cultural change. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. RP

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 127a / AMST 135a / WGSS 200a, U.S. Lesbian and Gay History George Chauncey

Introduction to the social, cultural, and political history of lesbians, gay men, and other socially constituted sexual minorities. Focus on understanding categories of

sexuality in relation to shifting normative regimes, primarily in the twentieth century. The emergence of homosexuality and heterosexuality as categories of experience and identity; the changing relationship between homosexuality and transgenderism; the development of diverse lesbian and gay subcultures and their representation in popular culture; religion and sexual science; generational change and everyday life; AIDS; and gay, antigay, feminist, and queer movements. HU

HIST 264b, Eastern Europe since 1914 Timothy Snyder

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 323b, Southeast Asia since 1900 Benedict Kiernan

Comparative colonialism, nationalism, revolution, and independence in modern Southeast Asia. Topics include Indonesia and the Dutch, Indochina under French rule, the United States in the Philippines and Vietnam, Buddhism in Burma and Thailand, communist and peasant movements, and the Cambodian revolution and its regional repercussions. 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 335b / AFST 335b, 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 385Ja, Reformers and Revolutionaries in the Arab World** Rosie Bsheer

Major social and intellectual trends of the Arab world and their relation to major events and movements of the twentieth century. The influence of colonial, postcolonial, and neocolonial thought; issues faced by activists, lawyers, feminists, leftists, nationalists, Islamists, secularists, liberals, and unionists; ways in which such struggles shaped people's social lives and futures; the causes and implications of current uprisings. WR, HU

* **HIST 388Ja / AFST 486a, Slavery and the Slave Trade in Africa** Robert Harms

The slave trade from the African perspective. Analysis of why slavery developed in Africa and how it operated. The long-term social, political, and economic effects of the Atlantic slave trade. WR, HU

History: Preindustrial

LITR 143b / FILM 240b, World Cinema Dudley Andrew

Development of ways to engage films from around the globe productively. Close analysis of a dozen complex films, with historical contextualization of their production and cultural functions. Attention to the development of critical skills. Includes weekly screenings, each followed immediately by discussion. HU

*** MUSI 353a / AFST 353a, Topics in World Music** Michael Veal

A critical introduction to selected cultures of world music. Specific cultures vary from year to year but generally include those of Native America, South Asia, Southeast Asia, sub-Saharan Africa, the Middle East, and the Caribbean. Preference to Music majors according to class. HU

*** PLSC 225a, Policing in America** Dean Esserman

Examination of major innovations in policing over the past three decades. The effects of these changes on crime control and public safety; the extent to which new approaches have been implemented in police departments; dilemmas these approaches have created for police management. Analysis of critical issues that persist in the profession, including race, the use of force, and police deviance. SO

*** PLSC 227a / EP&E 310a, Refugee Law and Policy** Alexandra Dufresne

Controversies and challenges in U.S. and international refugee law and policy, with a focus on asylum law and practice in the United States. Emphasis on legal reasoning and analysis through close reading of statutes, regulations, and case law. Final project is a legal brief on behalf of a client. SO

*** PLSC 245a / AFAM 268a, Urban Politics and Policy** Cynthia Horan

Approaches to urban politics and political economy. Application of theories to contemporary policy issues such as policing, metropolitan disparities, and inner-city revitalization. SO

*** PLSC 280b / AFAM 270b, Poverty, Politics, and Policy in the American City**

Cynthia Horan

Examination of how politics informs the formulation and implementation of policies to address urban poverty. Consideration of alternative explanations for poverty and alternative government strategies. Focus on efforts by local organizations and communities to improve their situations within the context of government actions. SO

*** PLSC 436a / GBL 361a, Violence: State and Society** Matthew Kocher

Examination of large-scale violence, generally within sovereign states. Why violence happens, why it takes place in some locations and not others, why it takes specific forms (insurgency, terrorism, civilian victimization), what explains its magnitude (the number of victims), and what explains targeting (the type or identity of victims). SO

*** SOCY 232b / AFST 348b / MMES 291b, Islamic Social Movements** Jonathan

Wyrzten

Social movement and network theory used to analyze the emergence and evolution of Islamic movements from the early twentieth century to the present. Organization, mobilization, and framing of political, nonpolitical, militant, and nonmilitant movements; transnational dimensions of Islamic activism. Case studies include the Muslim Brotherhood, Hamas, Hizbollah, Al-Qaeda, Al-Adl wa-Ihsann, and Tablighi Jama'at. SO

* **SOCY 314a / AFAM 273a / EP&E 244a / WGSS 316a, Inequality in America** Vida Maralani

Introduction to the current landscape of socioeconomic inequality in the U.S. Empirical, theoretical, and methodological facets of inequalities in education, occupation, income, wealth, health, neighborhoods, and intergenerational mobility; how these intersect with race and gender. Core questions include how different social groups fare and why, and what types of policies might address existing inequalities. WR, SO

* **SOCY 319a / 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 339b / AFST 373b / GLBL 362b / MMES 282b, Imperialism, Insurgency, and State Building in the Middle East and North Africa** Jonathan Wyrzten

The historical evolution of political order from Morocco to Central Asia in the past two centuries. Focus on relationships between imperialism, insurgency, and state building. Ottoman, European, and nationalist strategies for state building; modes of local resistance; recent transnational developments; American counterinsurgency and nation-building initiatives in the region. SO

* **THST 335a / AFST 435a, 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

* **WGSS 308a / ANTH 308a, Queer Ethnographies** Karen Nakamura

Exploration of both classic and contemporary ethnographies of gender and sexuality. Emphasis on understanding anthropology's contribution to and relationship with gay and lesbian studies and queer theory. SO RP

* **WGSS 380a / AMST 402a / ANTH 302a / FILM 324a, Gender and Sexuality in Media and Popular Culture** Vanessa Agard-Jones and Laura Wexler

Investigation of visual media and popular culture in the United States and transnationally. Gender, race, class, and sexuality in relation to the production, circulation, consumption, and reception of media culture. Focus on theories of media and the visual. Significant lab component in which students use media technologies to make and illustrate theoretical arguments. HU

WGSS 405a / EALL 211a, 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 471a and ER&M 472b, Individual Reading and Research for Juniors and Seniors Staff

For students who wish to cover material not otherwise offered by the program. The course may be used for research or for directed reading. In either case a term paper or its equivalent is required. Students meet regularly with a faculty adviser. To apply for admission, students submit a prospectus signed by the faculty adviser to the director of undergraduate studies.

* ER&M 491a, The Senior Colloquium: Theoretical and Methodological Issues Staff

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 Staff

Independent research on a one-term senior essay or project.

Film and Media Studies

Director of undergraduate studies: J. D. Connor, 559 LORIA, 432-8225,
jd.connor@yale.edu; filmstudies.yale.edu

FACULTY ASSOCIATED WITH THE PROGRAM OF FILM AND MEDIA STUDIES

Professors *Dudley Andrew (*Comparative Literature, Film & Media Studies*), Hazel Carby (*African American Studies, American Studies*), *Francesco Casetti (*Humanities, Film & Media Studies*), *Katerina Clark (*Comparative Literature, Slavic Languages & Literatures*), Michael Denning (*American Studies, English*), *John Mack Faragher (*History*), *Aaron Gerow (*East Asian Languages & Literatures, Film & Media Studies*), Inderpal Grewal (*Women's, Gender, & Sexuality Studies*), Benjamin Harshav (*Comparative Literature*), Stathis Kalyvas (*Political Science*), *Thomas Kavanagh (*French*), *John MacKay (*Chair*) (*Film & Media Studies, Slavic Languages & Literatures*), *Millicent Marcus (*Italian*), Donald Margulies (*Adjunct*) (*English, Theater Studies*), Giuseppe Mazzotta (*Italian*), Kobena Mercer (*History of Art, African American Studies*), Christopher L. Miller (*African American Studies, French*), *Charles Musser (*American Studies, Film & Media Studies*), *Brigitte Peucker (*German, Film & Media Studies*), Joseph Roach (*English, Theater Studies*), *Michael Roemer (*Adjunct*) (*Art, American Studies*), Alan Trachtenberg (*Emeritus*), *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*), Karen Nakamura (*Anthropology*), Brian Walsh (*English*), R. John Williams (*English*)

Assistant Professor *J. D. Connor (*History of Art, Film & Media Studies*)

Senior Lecturers *John Crowley (*English*), *Ron Gregg (*American Studies, Film & Media Studies*)

Lecturers *Jonathan Andrews (*Art, Film & Media Studies*), James Charney (*School of Medicine*), *Michael Kerbel (*American Studies, Film & Media Studies*), *Marc Lapadula (*Film & Media Studies*)

Critic *Sandra Luckow (*Art*)

Senior Lector II Seungja Choi (*East Asian Languages & Literatures*)

Senior Lectors Krystyna Illakowicz (*Slavic Languages & Literatures*), Karen von Kunes (*Slavic Languages & Literatures*)

*Member of the Film and Media Studies Committee.

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 early in their academic careers.

The Film and Media Studies major consists of fourteen term courses, including the prerequisite. A maximum of one course taken Credit/D/Fail may count toward the major with permission of the director of undergraduate studies.

Prerequisite Students normally take FILM 150 in their freshman or sophomore year. This course is useful preparation, and in some cases a prerequisite, for many other courses in the major.

Required courses Students are required to take FILM 320, preferably during their sophomore year. They must also take a course in film theory, preferably by the end of their junior year, selected from FILM 312, 314, 333, or 345. In addition, students must devote two term courses, preferably upper-level courses, to the study of representative films from at least two different nations or cultures (German expressionist cinema, Italian cinema, American comedy).

Students must take one term course on the creative process in film. Appropriate courses are listed under "Production Seminars," but other courses in art, theater studies, or creative writing may be substituted with the permission of the director of undergraduate studies.

Area of concentration With the help of the director of undergraduate studies in Film and Media Studies, each student defines an area of concentration comprising six courses leading up to and including the senior requirement. The six courses should form a coherent program in which the study of film and media is integrated with a particular discipline (history of art, literature, philosophy, the social sciences) or area of investigation (theory, production, race and gender, photography, national or regional cultures, new media). The focus of the concentration might be production (screenwriting, documentary filmmaking), history and theory of cinema (German

expressionism, cinema, and politics), or media old and new (digital animation, television series).

Students choosing a production-related concentration 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. Production students pursuing screenwriting often begin with FILM 350. They must take at least seven non-production courses in the major. FILM 150, 312, 320, 333, 345, and the two required courses on national cinemas may be counted among the seven. Students with a concentration in filmmaking should also take courses in screenwriting, and vice versa.

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. 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 director of undergraduate studies 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 area of concentration. 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.

Students who wish to complete a senior project as an alternative to an essay 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 fourteen courses required for the major, because FILM 493 or 494 does not count toward the fourteen 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 fourteen courses required for the major.

Majors graduating in December must submit their senior essays or senior projects to the director of undergraduate studies by December 11; those graduating in May, by April 29. A second reader assigned by the director of undergraduate studies participates in evaluating the essays and/or projects.

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.

All majors 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.

Film and Media Studies draws on the resources of many 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 for each student normally determines the relevance and acceptability of other courses.

REQUIREMENTS OF THE MAJOR

Prerequisite FILM 150

Number of courses 14 term courses, incl prereq and senior req

Specific courses required FILM 320; FILM 312, 314, 333, or 345

Distribution of courses 6 courses in area of concentration; 2 courses in different national cinemas; 1 production course; if concentration is production-related, at least 7 non-production courses

Senior requirement 2 terms of senior-level sems, or 2 terms of senior essay (FILM 491, 492), or 1 term of each; or 2 terms of senior project in FILM 455, 456, or 483, 484, and either FILM 493 or 494, for a total of 15 term courses; or 2 terms of senior project in FILM 493, 494 with approved petition

Intensive major Both senior essay and senior project

Required Courses

FILM 150a, 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 312a / LITR 354a, Theory of Media Francesco Casetti

Introduction to key issues in media studies. Relationships between commodity, artwork, and networks of exchange; media and public sphere; the analysis of radio and television; alternative or counter-hegemonic conceptions of media; and the viability of the concept "media" itself. HU

*** FILM 320b / HSAR 490b, Close Analysis of Film** J. D. Connor

Ways in which traditional genres and alternative film forms establish or subvert convention and expectation and express thematic and ideological concerns. The balancing of narrative containment and excess, as well as action and image. Use of body and voice, space and music. Examples include films by Antonioni, Zhang, Ozu, and Hitchcock. Prerequisite: FILM 150. HU

National Cinemas

FILM 240b / LITR 143b, World Cinema Dudley Andrew

Development of ways to engage films from around the globe productively. Close analysis of a dozen complex films, with historical contextualization of their production and cultural functions. Attention to the development of critical skills. Includes weekly screenings, each followed immediately by discussion. HU

*** FILM 307b / EALL 280b, East Asian Martial Arts Film** Aaron Gerow

An investigation of the martial arts films of East Asia (Japan, China, Hong Kong, Korea, Taiwan), including the samurai film, kung-fu and karate film, and wuxia film, and the roles they play in constructing nationalism and transnationalism, gender, stardom, spirituality, and mediality. HU

*** FILM 325a / AMST 225a, American Film Comedy** Michael Roemer

A study of the great American film comedians and an investigation into the psychology of laughter. Comedians from Chaplin and Keaton to the Marx brothers and Fields examined against a background of European comedy. Comic form and technique and their relevance to the American scene. Not a history of American film comedy. Priority to juniors and seniors majoring in American Studies or in Film & Media Studies. HU
RP

*** FILM 374a / MUSI 356a / SAST 357a, Bollywood's Music, Image, and Culture** Staff

Hindi/Urdu cinema – Bollywood – examined through its music. Focus on musical styles, production techniques, performers, and visual tropes since the mid-twentieth century. Ways that music, images, and narratives express and contest social identities; Hindi film music's relationship with political and religious change in the context of colonial and postcolonial South Asia; and how economic, technological, and aesthetic considerations have influenced the creation of Hindi film songs. HU

*** FILM 384a / EALL 284a / EAST 463a, North Korea through Film** Staff

Introduction to the cultural history of North Korea, with a focus on the politics, ethics, and aesthetics of visual representation. Styles and forms range from independent documentary to official propaganda to big-budget studio films. The fundamentals of film analysis; major texts on North Korea's society, history, and political system. HU

* **FILM 416a / FREN 394a / LITR 366a, 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 419b / LITR 382b, German New Waves in Cold War Europe** Katie Trumpener

Comparative study of New Wave cinema in East and West Germany, with a focus on aesthetic ferment, institutional barriers, and transformation. Berlin as the best place to follow Europe's emerging cinematic New Waves before 1961. Distinctive approaches developed by young filmmakers in East and West Germany to political and documentary filmmaking, to the Nazi past and the Cold War, and to class, gender, and social transformation. Knowledge of German helpful but not necessary. WR, HU

* **FILM 448a / EALL 271a, Japanese Cinema after 1960** Aaron Gerow

The development of Japanese cinema after the breakdown of the studio system, through the revival of the late 1990s, and to the present. No knowledge of Japanese required. HU TR

* **FILM 457b / ITAL 303b / LITR 359b, Italian Film from Postwar to Postmodern**

Millicent Marcus

A study of important Italian films from World War II to the present. Consideration of works that typify major directors and trends. Topics include neorealism, self-reflexivity and metacinema, fascism and war, and postmodernism. Films by Fellini, Antonioni, Rossellini, De Sica, Visconti, Pasolini, Bertolucci, Wertmuller, Tornatore, and Moretti. Most films in Italian with English subtitles. WR, HU

* **FILM 474b / FREN 396b, World War II in French Cinema** Alice Kaplan

A study of French films dealing with everyday life in France during the Nazi occupation (1940–44). Close analysis of scenes and cinematic techniques, historical readings, and film criticism. L5, HU

Film Theory, Visual Media, and Special Topics

* **FILM 045a / THST 099a, Dance on Film** Emily Coates

An examination of dance on film from c. 1920 to the present, including early Hollywood pictures, the rise of Bollywood, avant-garde films of the postwar period, translations of stage choreography to screen, music videos, and dance film festivals. The impact of industry, circulation and audience, aesthetic lineages, and craft in the union of the two mediums. Students develop an original short film for a final class project. No prior dance or filmmaking experience necessary. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **FILM 242a / ENGL 308a / HUMS 454a / LITR 398a, Interpreting Film Masterpieces**

Dudley Andrew and David Bromwich

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 285a / HSAR 328a, Disney J. D. Connor

History of the Walt Disney Company from origins to today. Early animation, popular modernism, mid-century television, development of the theme parks and nature films,

the Disney princess, the animation renaissance, and the current portfolio of brands, such as Pixar, Marvel, and LucasFilm. WR, HU

FILM 318a / PLSC 352a, Politics and Film Stathis Kalyvas

Film as a lens for making sense of the varied landscape of political violence, including insurgency, terrorism, state repression, and genocide. Ways in which fiction film is an ideal language for conveying complex insights; how social science can build on these insights to produce a deeper understanding of political violence. Recommended preparation: PLSC 116. HU, SO

FILM 321b / AMST 351b, Hollywood in the Twenty-First Century Ronald Gregg

Examination of how globalization and the global success of American films have affected Hollywood film production, stardom, distribution, and exhibition, as well as the aesthetics of film image, sound, and narration. Topics also include the effects of new digital technologies on film aesthetics, spectacle, spectatorship, and exhibition, and the responses of independent and other national cinemas to Hollywood's hegemony. HU

* **FILM 324a / AMST 402a / ANTH 302a / WGSS 380a, Gender and Sexuality in Media and Popular Culture** Vanessa Agard-Jones and Laura Wexler

Investigation of visual media and popular culture in the United States and transnationally. Gender, race, class, and sexuality in relation to the production, circulation, consumption, and reception of media culture. Focus on theories of media and the visual. Significant lab component in which students use media technologies to make and illustrate theoretical arguments. HU

* **FILM 358b / GMAN 369b / LITR 427b, Text and Image: The Double of Interpretation** Rüdiger Campe and Florian Fuchs

The textuality of vision and the visibility of text in the interpretation of artifacts in Western culture. The pairing of text and vision traced in literary and theoretical readings and in examples from visual art and film. Conditions, variations, and consequences of this unique media configuration and the politics of its interpretation. Case studies range from Plato to Hobbes, Kleist to Flaubert, and baroque emblems to computer diagrams. HU

* **FILM 364a / CZEC 246a / RSEE 240a, Milos Forman and His Films** Karen von Kunes

An in-depth examination of selected films by Milos Forman and representatives of the New Wave, *cinéma vérité* in Czech filmmaking. Special attention to Forman's artistic and aesthetic development as a Hollywood director in such films as *Hair*, *One Flew over the Cuckoo's Nest*, *Ragtime*, and *Amadeus*. Screenings and discussion in English. HU

* **FILM 377a / WGSS 454a, Postwar Queer Avant-Garde Film** Ronald Gregg

Production, exhibition, and aesthetic practices in postwar queer underground cinema in the United States as it developed from the 1930s to the early 1970s. The films of gay or bisexual filmmakers such as Willard Maas, Andy Warhol, Jack Smith, Kenneth Anger, and José Rodríguez-Soltero; the work of antiheteronormative female filmmakers such as Barbara Rubin and Marie Menken; the links between avant-garde cinema, theater, and other arts, as well as the political context. HU

* **FILM 424a / AFAM 377a / AMST 359a, Urban Narratives of Injustice in *The Wire***

Hazel Carby

Narratives of injustice, crime, and the policing of citizens as represented in *The Wire*, critically acclaimed as the finest television drama ever made, plus additional readings.

HU

* **FILM 469a / AMST 306a, The Films of Martin Scorsese** Michael Kerbel

Close analysis of Scorsese's films, with attention to his themes and styles and to ways in which his works have assimilated literary and cinematic influences, reflected their eras, and influenced other directors. Scorsese's work examined in the context of film history, and of U.S. culture and history, from the 1960s to the present. HU RP

* **FILM 475b / ENGL 411b, Shakespeare on Film** Brian Walsh

A survey of the lively tradition of putting Shakespeare's plays on film, from the beginnings of cinema at the close of the nineteenth century to the present day. WR, HU

* **FILM 476a / ENGL 307a, Hollywood Novel and Film** Charles Musser

The history of novels and films about Hollywood. Ways in which the closely related forms of novel and film portray "the dream factory" — its past, present, and future — as well as the way the forms interact. Books include *Merton at the Movies* (1922), *I Should Have Stayed Home* (1938), *Loves of the Last Tycoon* (1940), and *The Player* (1988). Films include *What Price Hollywood?* (1932), *A Star is Born* (1937), *Sunset Boulevard* (1950), *In a Lonely Place* (1950), and *The Player* (1992). May not be taken after AMST S321/FILM S180. HU

Production Seminars

* **FILM 161a / ART 141a, Introductory Film Writing and Directing** Michael Roemer

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. Materials fee: \$150. Priority to majors in Art and in Film & Media Studies. Prerequisite for majors in Film & Media Studies: FILM 150.

RP

* **FILM 162a or b / ART 142a or b, 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 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 355a or b / ART 341a or b, Intermediate Film Writing and Directing Staff

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 141 or 142, and FILM 150. RP

FILM 356b / ART 342b, 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 359a / MUSI 345a, Introduction to Sound Studies** Brian Kane
A broad introduction to sound studies, an emerging field that analyzes both the technologies and the cultural techniques involved in the production, reception, and meaning of sound and listening. Topics include soundscapes, voice, modes of listening, audio technologies, electronic music, and noise. How sound studies intersects with more traditional methods of music studies. HU

* **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 396b / ENGL 461b, Writing for Film: Voice and Vision** John Crowley
Practice in all aspects of writing a screenplay. Focus on elements shared with other forms of fiction, including story, character, narrative, personal voice, and audience expectations. Study of one or more published screenplays in conjunction with viewings of the resulting films. Students plan, pitch, outline, and write a large part of a single screenplay, in addition to shorter exercises in screenplay craft. RP

* **FILM 397b / ENGL 244b / THST 228b, Writing about the Performing Arts**
Margaret Spillane
Introduction to journalistic reporting on performances as current events, with attention to writing in newspapers, magazines, and the blogosphere. The idea of the audience explored in relation to both a live act or screening and a piece of writing about such an event. Students attend screenings and live professional performances of plays, music concerts, and dance events. HU

* **FILM 455a and FILM 456b / AMST 463a and AMST 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.

Forestry and Environmental Studies

Program adviser: John Wargo, 124 KRN, 432-5123, john.wargo@yale.edu

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. degree from the School of Forestry & Environmental Studies

in five years. For more information on the joint program, see the School's Web site (<http://environment.yale.edu/academics/degrees/five-year>). 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 (<http://www.yale.edu/printer/bulletin/htmlfiles/forestry>), and most also appear in the online bulletin of the Graduate School of Arts and Sciences (<http://www.yale.edu/printer/bulletin/htmlfiles/grad>).

Information about the programs of the School of Forestry & Environmental Studies may be found on the School's Web site (<http://environment.yale.edu>). Most lectures and symposia are open to undergraduates.

Courses

* **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 freshmen. Preregistration required; see under Freshman Seminar Program. WR

* **F&ES 221a / E&EB 230a / EVST 221a, Field Ecology** Linda Puth
A field-based introduction to ecological research, using experimental and descriptive approaches, comparative analysis, and modeling for field and small-group projects. Weekly field trips explore local lake, salt marsh, rocky intertidal, traprock ridge, and upland forest ecosystems. Includes one Saturday field trip and a three-day trip during the October recess. Concurrently with or after E&EB 220 or with permission of instructor. SC

* **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 315a / E&EB 115a, Conservation Biology Linda Puth and Jeffrey Powell
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

F&ES 327a / ENVE 327a / G&G 327a, Atmospheric Chemistry Nadine Unger
The chemical and physical processes that determine the composition of the atmosphere; implications for climate, ecosystems, and human welfare. Origin of the atmosphere; photolysis and reaction kinetics; atmospheric transport of trace species; stratospheric ozone chemistry; tropospheric hydrocarbon chemistry; oxidizing power, nitrogen, oxygen, sulfur, and carbon cycles; interactions between chemistry, climate, and biosphere; aerosols, smog, and acid rain. Prerequisites: CHEM 161, 165, or 167 (or CHEM 115 or 118), and MATH 120, or equivalents. ENAS 194 recommended. QR, SC

* **F&ES 384a / ANTH 382a / EVST 345a, Environmental Anthropology** Michael Dove
History of the anthropological study of the environment: nature-culture dichotomy, ecology and social organization, methodological debates, politics of the environment, and knowing the environment. SO

French

Director of undergraduate studies: Christopher Semk, Rm. 326, 82–90 Wall St., 432-4902, christopher.semk@yale.edu; language program director: Ruth Koizim, Rm. 319, 82–90 Wall St., 432-4904, ruth.koizim@yale.edu; french.yale.edu

FACULTY OF THE DEPARTMENT OF FRENCH

Professors R. Howard Bloch, Edwin M. Duval, Marie-Hélène Girard (*Visiting*), Alice Kaplan (*Chair*), Christopher L. Miller, Maurice Samuels

Assistant Professors Morgane Cadieu, Thomas C. Connolly, Christopher Semk

Senior Lecturers Lauren Pinzka, Maryam Sanjabi

Lecturer Diane Charney

Senior Lectors Kathleen Burton, Ruth Koizim, Soumia Koundi, Matuku Ngame, Françoise Schneider, Constance Sherak, Candace Skorupa

Lector Vanessa Vysosias

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 greatest and richest literatures 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 not only in academics but also in a wide range of fields from law and diplomacy to journalism and the arts. Recent graduates have gone on to selective law schools and graduate programs in French and comparative literature. Others work in primary and secondary education, business, government, 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. 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 under Section K, Special Arrangements, (p. 65) in the Academic Regulations.

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 (<http://cipe.yalecollege.yale.edu>) and from Ruth Koizim (ruth.koizim@yale.edu), the study abroad adviser for the Department of French.

Prerequisite for the major Candidates for the major should take FREN 150 or the equivalent during the freshman or sophomore year. Prospective majors are strongly encouraged to take at least one literature course numbered 170 or above before the end of the sophomore year.

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 director of undergraduate studies, 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 director of undergraduate studies may grant exceptions to this limit for students who spend two academic terms in an approved study abroad program.) Relevant freshman seminars may count toward the major, with permission of the director of undergraduate studies.

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.

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 director of undergraduate studies by September 18 (fall-term essay) or November 13 (spring-term

essay). A one-page prospectus and bibliography are due September 25 (fall term) or January 29 (spring term). A rough draft must be submitted to the adviser by November 6 (fall term) or April 1 (spring term). Two copies of the final essay are due in the department by December 7 (fall term) or April 25 (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 director of undergraduate studies by September 18. A one-page prospectus and bibliography are due September 25. Students must submit an initial rough draft to their adviser by January 29 and a complete draft by April 1. Two copies of the final essay are due in the department by April 25.

All majors 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 director of undergraduate studies 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 director of undergraduate studies. Students planning to study abroad or to petition for completion of two majors should contact the director of undergraduate studies during the sophomore year. Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

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 director of undergraduate studies in French by the fall term of the junior year. For further information, see under Special Divisional Majors (p. 636).

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. For further details, students should consult 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.

Placement The departmental placement exam in French is accessible on line over the summer. Dates and information for the exam will be available on the French

Department Web site (<http://french.yale.edu/academics/placement-and-registration>), in the *Calendar for the Opening Days of College*, and on the Center for Language Study Web site (<http://cls.yale.edu/placement-testing>).

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

Prerequisite FREN 150 or equivalent

Number of courses *Standard major*—10 term courses numbered 160 or above; *Intensive major*—12 term courses numbered 160 or above

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; *Intensive major*—same, 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); *Intensive major*—one-term (FREN 491) or two-term (FREN 493, 494) senior essay in French or English

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. Mandatory weekly tests given on Mondays at 30-minute intervals from 5 to 8:30 p.m. To be followed by FREN 120. For students with no previous experience of French. Daily classroom attendance is required. Credit only on completion of FREN 120. L1 RP 1½ Course cr

* **FREN 120b, Elementary and Intermediate French II** Staff

Continuation of FREN 110. Conducted entirely in French. Only after FREN 110. To be followed by FREN 130. L2 RP 1½ Course cr

* **FREN 121a, Intermediate French** Candace Skorupa

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** Candace Skorupa

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, Introduction to the Study of Literature in French** 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

*** FREN 171b, Introduction to the Study of Literature in French for Students of Directed Studies** Edwin Duval

An introduction to close reading and analysis of literary texts written in French, for current and former students of Directed Studies. Similar in content to FREN 170, but specifically designed to build on readings in DRST 001 and 002. Works by authors such as Du Bellay, Racine, Baudelaire, Flaubert, Proust, and Sartre. Prerequisites: DRST 001 or 002; FREN 150, or equivalent with permission of instructor and the director of undergraduate studies. May not be taken after FREN 170. L5, HU

ADVANCED LANGUAGE COURSES

*** FREN 195a, Advanced 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 198b, Applied Advanced French Grammar** 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

GENERAL FIELDS

*** FREN 211a, French Poetry: The First Five Hundred Years** Edwin Duval

A survey of the first half-millennium of French poetry, from courtly love songs by the *Trouvères* of the late twelfth century to satirical verse by the *Libertins* of the early seventeenth. Special focus on the great flowering of lyric poetry during the Renaissance.

The musical origins and aspirations of lyric poetry in France. Emphasis on close readings of representative works by major poets. L5, HU

* **FREN 233a, French Fiction since the 1990s** Morgane Cadieu

Exploration of literary life in contemporary France. Literature in the media; the figure of the writer, including prizes, publishing houses, and literary quarrels; the legal status of texts, trials for plagiarism, and violation of privacy; new literary movements and genres. Works by Modiano, Ernaux, Guibert, Angot, Houellebecq, Darrieussecq, NDiaye, Garréta, Toussaint, and Echenoz. L5, HU

* **FREN 265a / THST 265a, French Classical Tragedy** Christopher Semk

Comprehensive survey of seventeenth-century French tragedy, with an emphasis on performance. Stylistic features and major themes of tragedy; the material conditions of early modern performance; the art of declamation; recent productions, including both those that seek to reproduce early modern practices and those that modernize the plays. Works by Bernard, Corneille, Racine, and Rotrou. L5, HU

SPECIAL TOPICS

* **FREN 307b, Trains in French Literature, Film, and History** Morgane Cadieu

The aesthetics of trains in French and Francophone literature and culture. Survey of major literary movements in France from the nineteenth century to the present; trains and subways in French film, visual arts, and comics; the role of trains in French history, including industrialization, deportation, and colonization; theory on cities and public transportation. May not be taken after FREN 306. WR, HU

* **FREN 309a, Shopping and the Novel** Morgane Cadieu

Representations of shopping and consumerism in French literature, cinema, and culture from the nineteenth century to the present. The politics of window shopping, mythology of French commodities, rhetoric of advertisements, aesthetics of supermarkets, and literary versions of consumer society. An overview of major authors with an introduction to literary theory and sociology. WR, HU

FREN 310b / LITR 191b, Louis XIV and the Culture of Absolutism Christopher Semk

An exploration of the major literary works of seventeenth-century France, with special emphasis on the relationship between absolutism and cultural life. Artistic patronage and the institutionalization of the arts, support for and subversion of royal authority, and the characteristics of classical style. HU

* **FREN 366a / HSAR 251a, 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 394a / FILM 416a / LITR 366a, 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 396b / FILM 474b, World War II in French Cinema** Alice Kaplan

A study of French films dealing with everyday life in France during the Nazi occupation (1940–44). Close analysis of scenes and cinematic techniques, historical readings, and film criticism. L5, HU

* **FREN 399a / HUMS 400a / PLSC 316a, Modernities** R. Howard Bloch and Steven Smith

An interdisciplinary study of philosophy, social thought, and some key literary works connected to two moments of modernity – the Enlightenment and the period of the "great upheaval" (1870–1915). HU, SO

* **FREN 412b / AFAM 287b / AFST 412b / LITR 250b, Postcolonial Theory and Literature** Christopher Miller

A survey of the principal modes of thought that have animated decolonization and life after colonialism, as seen in both theoretical and literary texts. Concentration on the British and French imperial and postcolonial contexts. Readings in negritude, orientalism, psychoanalysis, poststructuralism, and novels. Lectures in English; readings available both in French and in English translation. HU TR RP

Special Tutorial and Senior Courses

* **FREN 470a and FREN 471b, Special Tutorial for Juniors and Seniors** Christopher Semk

Special projects set up by the student in an area of individual interest with the help of a faculty adviser and the director of undergraduate studies. Intended to enable the student to cover material not offered by the department. The project must terminate with at least a term paper or its equivalent and must have the approval of the director of undergraduate studies. Only one term may be offered toward the major, but two terms may be offered toward the bachelor's degree. For additional information, consult the director of undergraduate studies.

* **FREN 491a or b, The Senior Essay** Christopher Semk

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, The Senior Essay in the Intensive Major** Christopher Semk

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.

Reading Course

* **FREN 109a or b, 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.

Freshman Seminar Program

The Freshman Seminar program offers a diverse array of courses open only to freshmen and designed with freshmen 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 freshman 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's Web site (<http://yalecollege.yale.edu/new-students/class-2019/academic-information/special-programs-placement-and-preregistration/freshman>).

COURSES

* **AFAM 008a / AFST 008a / HSAR 009a, Aesthetics and Meaning in African Arts and Cultures** Erica James

The diversity of artistic production on the African continent, both historically and materially. The creative consciousness and aesthetic values of a variety of African cultures from ancient to contemporary times. Questions that arise when writing these histories without fully taking into account concepts of "African time." HU

* **AFAM 060b / AMST 060b / HIST 016b, Significance of American Slavery** Edward Rugemer

The history of American slavery, its destruction during the nineteenth century, and its significance today. Topics include the origins of slavery, the development of racism, the transatlantic slave trade, the experience of enslavement, resistance to slavery, the abolitionist movement, the process of emancipation, and the perpetuation of slavery and other forms of unfree labor in the twenty-first century. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **AMST 010b, Islam in the United States** Zareena Grewal

Introduction to ethnic studies and ethnographic film and writing through the study of Islam in the United States. The wide variety of Muslim ethnic and racial and immigrant groups in the United States and the new forms of religious life that develop from their interaction. Global and universal elements of Islam; elements that are specific to place and community, including what is American about Islam in America. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **AMST 019a / HIST 018a, Commodities as U.S. History** Matthew Jacobson

American social, cultural, and political history introduced through study of the production, distribution, and consumption of common commodities. Topics include political economy, slavery, industrialization, labor, the rise of the corporation, the growth of the administrative and regulatory state, geopolitics, foreign policy, and cultural change. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. RP

* **ARCH 005a, Modern Architecture and the City** Karla Britton

Issues in modern American architecture and urbanism examined through the work of prominent architects closely associated with Yale and New Haven. Perspectives on the character, development, and sociocultural consequences of building today. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.
HU

* **ART 002b, Paper** Elana Herzog

Paper as a material for making art. How paper is made; myriad ways that it is used in the collections of Yale's galleries and libraries. Creation of paper objects to explore the formal properties of sculpture, including volume, mass, line, and structure. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.
RP

* **ART 003a, Blue** Jessica Helfand

The cultural and iconic history of the color blue and its role as both a method and a motive for making work in the studio. The word "blue" and its etymological core, evocative connotations, colloquial nuance, and semantic role in different languages and cultures; scientific and sociological issues; blue in film and the fine arts. Projects experiment with writing, collecting, collage, and digital video. Use of materials from the Beinecke Library. Enrollment limited to 15 freshmen. Preregistration required; see under Freshman Seminar Program. HU

* **ART 004a, Words and Pictures** Dushan Petrovich

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 freshmen. Preregistration required; see under Freshman 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 freshmen. Preregistration required; see under Freshman Seminar Program. HU

* **ASTR 030a, Search for Extraterrestrial Life** Michael Faison

Introduction to the search for extraterrestrial life. Review of current knowledge on the origins and evolution of life on Earth; applications to the search for life elsewhere in the universe. Discussion of what makes a planet habitable, how common these worlds are in the universe, and how we might search for them. Survey of past, current, and future searches for extraterrestrial intelligence. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, SC

* **ASTR 040b, Expanding Ideas of Time and Space** Louise Edwards

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 freshmen.

Preregistration required; see under Freshman Seminar Program. SC

* **CLCV 056b, Ancient Myth, Fiction, and Science Fiction** Pauline LeVen

A survey of ancient Greek and Roman myths and an introduction to the prose fiction and science fiction of 2500 years ago. Crucial questions asked by Greek and Roman myths; how myths were an integral part of important ancient institutions; ways in which myths, fiction, and science fiction represented the world and the notion of "truth" in different ways. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **CLCV 057a / HIST 021a, The Age of Constantine** Noel Lenski

The world of late antiquity explored through the pivotal figure of Constantine the Great, Rome's first Christian ruler. Focus on the third and fourth centuries C.E. Themes of politics, religion, society and economy, history of art and architecture, warfare, administration, foreign policy, and multiculturalism. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **CPSC 079b, Digital Photorealism** Julie Dorsey

Basic methods used to define shapes, materials, and lighting when creating computer-generated images. Mathematical models for shape, texture models, and lighting techniques. Principles are applied through the use of modeling/rendering/animation software. Proficiency in high school–level mathematics is assumed. No previous programming experience necessary. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. QR

* **ENGL 010b, Jane Austen** Stefanie Markovits

Close study of Austen's novels, with special attention to the critique of social and literary convention. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

English: Pre-1900 Lit

* **ENGL 011b / PLSC 025b, Lincoln in Thought and Action** David Bromwich

An intensive examination of the career, political thought, and speeches of Abraham Lincoln in their historical context. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

English: American Lit

English: Pre-1900 Lit

* **ENGL 012b / AMST 016b, Literary Cities: New York, Chicago, San Francisco**

Wai Chee Dimock

An introduction to American literature, told through the vibrant lives, ethnic diversities, and innovative genres revolving around three urban centers. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

English: American Lit

* **ENGL 015a / AFST 015a, South African Writing after Apartheid** Staff

An introduction to creative writing published in South Africa from the end of Apartheid in 1994 to the present. Close readings of contemporary fiction with additional material drawn from popular culture, including films, magazines, and music. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **ENGL 017b, Shakespeare's Major Tragedies** David Kastan

Detailed exploration of Shakespeare's *Hamlet*, *Othello*, *King Lear*, and *Macbeth*. What makes the plays great in a way that almost all readers and audiences have recognized. The works as plays to be performed, as drama to be read, as texts that have been constructed by the activities of various people, and as plays deeply embedded in the history of their own moment, as well as in later histories for which they are in some part responsible. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU
English: Pre-1800 Lit

* **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 freshmen. Preregistration required; see under Freshman Seminar Program. WR

* **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 015b, History of Food and Cuisine** Paul Freedman

The history of food from the Middle Ages to the present, with a focus on the United States and Europe. How societies gathered and prepared food; culinary tastes of different times and places. The influence of taste on trade, colonization, and cultural exchange. The impact of immigration, globalization, and technology on food. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU

* **HIST 020b / ARCG 020b / CLCV 059b / EVST 030b / NELC 026b, Rivers and Civilization** Joseph Manning and 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. Includes a week-long field trip to Turkey. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU, SO

* **HIST 030a / EAST 030a, Tokyo** Fabian Drixler

Four centuries of Japan's history explored through the many incarnations, destructions, and rebirths of its foremost city. Focus on the solutions found by Tokyo's residents to the material and social challenges of concentrating such a large population in one place. Tensions between continuity and impermanence, authenticity and modernity, and social order and the culture of play. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **HIST 032a / EAST 032a, Shanghai** Denise Ho

History of the city of Shanghai, with a focus on how Shanghai has been seen and what its experience reveals about modern China. Shanghai's unique place in imagining China; its transformation in the nineteenth century from a fishing village to an international "treaty port" and China's gateway to the West; twentieth-century Shanghai as a site of innovation, from politics and capitalism to media and fashion; the city's vilification in the early Mao years and later reemergence as a symbol of China's modernization. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **HIST 033b / WGSS 033b, 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 freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **HIST 042a, Oil and Empire** Rosie Bsbeer

The political and social history of oil since the late nineteenth century, including global trends and processes. Oil's impact on the rise and fall of empires and the fates of nation-states; its role in war and its impact on social and cultural life. Focus on the Middle East, with some attention to Venezuela, Indonesia, and the Niger Delta. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **HIST 045a, The Holocaust and Its Afterlives** Jennifer Allen

The history and memory of the Holocaust in Germany. How the Holocaust itself unfolded, and how Germany has worked through its legacy. Guilt and complicity, the logic of the concentration camps, the limits of totalitarianism, the representations of horror, the prosecution of atrocity, Holocaust memory across generations, and Germany's urban memory landscape. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **HIST 070a, Lawyers as Rebels** Rohit De

Examination of how lawyers have worked in illiberal and unjust legal systems. Key themes in global history of the twentieth century, such as imperialism, nationalism, apartheid, holocaust, civil rights, communism, feminism, and LGBT rights. Case studies include Gandhi, Mandela, Hersch Lauterpacht, Pauli Murray, and Asma Jahangir. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **HIST 072b, 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. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU RP

* **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.

* **HUMS 076a / HSHM 007a, Epidemics in Global Perspective** William Summers
Interaction of epidemic diseases and society. The response of government, medicine, and the public to the threat or actual presence of widespread contagious diseases. The notion of major epidemics as one of the key contingencies of history, critically examined through contemporary medical, political, and literary accounts. The changing responses of societies and governments to epidemics as well as the reasons for those responses. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU, SO

* **HUMS 078a, Shakespeare and Music** Judith Malafronte
The use of music in Shakespeare's plays, from the original stagings and seventeenth-century adaptations to modern productions. Consideration of operatic versions of the plays from the nineteenth, twentieth, and twenty-first centuries. Includes a field trip to New York City. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU

* **LING 005a, The Mental Lexicon** Maria Piñango
Examination of the mental lexicon, a hypothesized space in the mind that is built on long-term memory and that holds and manipulates the basic building blocks of language. The structure of this space as it is currently understood; subsystems connected by the mental lexicon, including word structure, sound structure, and meaning structure; real-time word processing and bilingualism. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. SO

* **LING 010b / HIST 013b, Language and Power** Claire Bower and Alejandra Dubcovsky-Joseph
The relationships between language and power explored through the perspectives of linguistics and history. How and when languages change, disappear, and are created. Focus on the Americas and on four outcomes of language contact and their social precursors: pidgins, creoles, mixed languages, and language death. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. SO

* **MB&B 050a, 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 freshmen with a strong background in biology and/or chemistry, typically demonstrated by a score of 4 or 5 on Advanced Placement examinations. Preregistration required; see under Freshman Seminar Program. 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 freshmen. Preregistration required; see under Freshman 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 freshmen. Preregistration required; see under Freshman Seminar Program. SC RP

* **MUSI 012b, One Thousand Years of Love Songs** Anna Zayaruznaya

History of the love song in Western culture from the twelfth-century troubadours to contemporary popular hits. Music and the shifting social constructions of desire over the past millennium. The song repertory's engagement with ideas and movements such as courtly love, humanism, romanticism, sexual libertinism, and the LGBT rights movement. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU RP

* **MUSI 030a, Faith and Doubt in Western Music** Henry Parkes

An exploration of spirituality, ideology, and philosophical worldviews in the great works of Western classical music. Religious and philosophical backgrounds of famous composers; the role of spirituality as a stimulus for creativity; the manner in which belief has shaped the reception of composers and works; the degree to which musical works communicate spiritual ideas or philosophies. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU

* **MUSI 065a, Shape-Note Traditions of the United States** Ian Quinn

Introduction to the folk-song process known as shape-note or Sacred Harp singing, a unique tradition of community a cappella music-making. The tradition's roots in colonial New England, growth in the southern states between the Civil War and the World Wars, and influence on later musical genres such as bluegrass and gospel. The history of American music, religion, and print culture; exploration of a way of relating to music that is fundamentally different from the performer-audience relationship; concepts of oral tradition. Includes a field trip to New York City. No singing experience or music-reading ability required. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU

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

Examination of approximately 10,000 years of Nile Valley cultural history, with an introduction to the historical and archaeological study of Egypt and Nubia. Consideration of the Nile Valley as the meeting place of the cultures and societies of northeast Africa. Various written and visual sources are used, including the collections of the Peabody Museum and the Yale Art Gallery. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.

WR, HU

* **RLST 017a, Authenticity** Noreen Khawaja

The origins of personal authenticity in Western thought and the impact of this idea on modern notions of truth, sincerity, and identity. The "true" self as a historical idea and as a social performance. Readings in philosophy, literature, and religious thought from antiquity to the present. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU

* **RUSS 023b, *Storytelling and the Russian Tradition*** Bella Grigoryan

An introduction to modern Russian literature via the genre of the short story. A sustained examination of the relationship between various modes of storytelling and modern literature. Emphasis on the aesthetic and ideological uses of storytelling in masterpieces of nineteenth- and twentieth-century Russian prose fiction. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.

WR, HU TR

* **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 only on completion of SCIE 031; one course credit is awarded for successful completion of the year's work. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.

½ Course cr per term

* **SOCY 018a, *The Sociological Imagination*** Julia Adams

Introduction to the linked study of sociology and modernity. Topics include the dramatic rise of capitalism; colonialism and empire; the advent of democracy and bureaucracy; the world-historical invention of the individual; and the contested role of religion in modernity. Readings from classical and contemporary authors.

* **THST 099a / FILM 045a, *Dance on Film*** Emily Coates

An examination of dance on film from c. 1920 to the present, including early Hollywood pictures, the rise of Bollywood, avant-garde films of the postwar period, translations of stage choreography to screen, music videos, and dance film festivals. The impact of industry, circulation and audience, aesthetic lineages, and craft in the union of the two mediums. Students develop an original short film for a final class project. No prior dance or filmmaking experience necessary. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program.

* **WGSS 032a, *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 freshmen.

Preregistration required; see under Freshman Seminar Program.

Geology and Geophysics

Director of undergraduate studies: David Bercovici, 305 KGL, 432-3168,
david.bercovici@yale.edu; earth.yale.edu

FACULTY OF THE DEPARTMENT OF GEOLOGY AND GEOPHYSICS

Professors Jay Ague (*Chair*), David Bercovici, Ruth Blake, Mark Brandon, Derek Briggs, Peter Crane, David Evans, Alexey Fedorov, Debra Fischer, Jacques Gauthier, Shun-ichiro Karato, Jun Korenaga, Mark Pagani, Jeffrey Park, Danny Rye, Brian Skinner, Ronald Smith, John Wettlaufer

Associate Professors William Boos, Kanani Lee, Mary-Louise Timmermans

Assistant Professors Bhart-Anjun Bhullar, Pincelli Hull, Maureen Long, Noah Planavsky, Trude Storelmo, Mary-Louise Timmermans, Nadine Unger

Lecturers Michael Oristaglio, Frank Robinson, Lawrence Schwartz, Catherine Skinner, Ellen Thomas

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, 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 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.

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 director of undergraduate studies.

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 a two-term lecture sequence in chemistry (or CHEM 118), physics (PHYS 180, 181 and PHYS 165L, 166L), computing (ENAS 130 or equivalent), and mathematics through differential equations (MATH 120 or ENAS 151, and ENAS 194). The major requirements consist of at least eleven term courses, for ten and one-half 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; 120; or 125 and 126L. A higher-level course in G&G can be substituted with the permission of the director of undergraduate studies. Six core courses, totaling five and one-half course credits, introduce students to Earth's climate system (G&G 140 and 141L), meteorology (G&G 322), physical oceanography (G&G 335), fluid mechanics (MENG 361), and statistics or linear algebra (STAT 230 or 238 or MATH 222). Three 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 director of undergraduate studies or

- on the departmental Web site (<http://earth.yale.edu/academics/undergraduate-program>). 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 a two-term lecture sequence in chemistry (or CHEM 118), 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; 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; 120; or 140 and 141L (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), 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), climate physics (G&G 322), and satellite-based image analysis (G&G 362). Four electives chosen from Geology and Geophysics, Environmental Studies (p. 303), Ecology and Evolutionary Biology (p. 241), 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 director of undergraduate studies or on the departmental Web site (<http://earth.yale.edu/academics/undergraduate-program>). 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); a two-term lecture sequence in chemistry, (or CHEM 118) 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 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 director of undergraduate studies. Four core courses give majors a comprehensive background in sedimentary rocks and rock correlation (G&G 230

- or equivalent), the study of evolution (G&G 250), microbiology in past and present environments (G&G 255), and statistical data analysis as applied to the life sciences (STAT 101). Four electives selected from Geology and Geophysics, Ecology and Evolutionary Biology (p. 241), Molecular, Cellular, and Developmental Biology (p. 507), and related fields offer students flexibility in pursuing their specific interests. A list of suggested electives is available from the office of the director of undergraduate studies or on the departmental Web site (<http://earth.yale.edu/academics/undergraduate-program>). 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 a two-term lecture sequence in chemistry (or CHEM 118); physics (PHYS 170, 171; 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; 120; 125 and 126L; or 140 and 141L. 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 mantle dynamics, earthquakes, and volcanoes (G&G 290), mountain building and global tectonics (G&G 212), rocks and minerals (G&G 220), sedimentary rocks and processes (G&G 230 or equivalent), and geochemical principles (G&G 301). Students also select four electives in geology, geochemistry, geophysics, or related topics. A list of suggested electives is available from the office of the director of undergraduate studies or on the departmental Web site (<http://earth.yale.edu/academics/undergraduate-program>). 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 freshman 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 geochemistry (G&G 301); and five additional courses at the 200 level or higher in Geology and Geophysics or related fields, approved by the director of undergraduate studies and including either the senior essay or the senior thesis. Course selections can be guided by any of the B.S. tracks described above.

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 director of undergraduate studies 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 departmental Web site (<http://earth.yale.edu>).

Selection of courses Geology and Geophysics majors may not employ the Credit/D/Fail option for prerequisites or for courses in the major. With permission of the director of undergraduate studies, 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 director of undergraduate studies, be substituted for prerequisites and for specific required courses. 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 director of undergraduate studies or see the departmental Web site (<http://earth.yale.edu>) for further information.

Physics and Geosciences major The Department of Geology and Geophysics also offers a combined major with the Department of Physics. For more information, see under Physics and Geosciences (p. 560).

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 “Simultaneous Award of the Bachelor’s and Master’s Degrees” under section K, Special Arrangements (p. 65), in the Academic Regulations. Interested students should consult the director of undergraduate studies prior to the sixth term of enrollment for specific requirements in Geology and Geophysics.

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* – a two-term lecture sequence in chem, or CHEM 118; MATH 120 or ENAS 151; *Atmosphere, Ocean, and Climate track* – ENAS 130 or equivalent; ENAS 194; PHYS 180, 181, 165L, 166L; *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, for 10½ credits, 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, 301; *B.S.*—*Atmosphere, Ocean, and Climate track*—G&G 140, 141L, 322, 335; MENG 361; STAT 230 or 238 or MATH 222; *Environmental and Energy Geoscience track*—4 from G&G 205, 255, 274, 275, 301, 322, 362; *Paleontology and Geobiology track*—G&G 110 or 115, 111L, 125, 126L, 230 or equivalent, 250, 255, STAT 101; *Solid Earth Science track*—4 from G&G 290, 212, 220, 230 or equivalent, 301

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; 3 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)

Courses

[G&G 010, Earth, Resources, Energy, and the Environment]

[G&G 020, Origins of Everything]

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 110a, Dynamic Earth 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

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 115b / EVST 200b, Earth System Science** Jeffrey Park

A survey of geoscience. Interaction of lithosphere, hydrosphere, atmosphere, and Earth's deep interior; natural controls on environment and climate in past, present, and future; rocks, minerals, glaciers, earthquakes, and volcanoes; natural hazards and natural resources. (Formerly G&G 200) SC

* **G&G 125b / E&EB 125b, History of Life** Derek Briggs

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 140a / EVST 201a, Atmosphere, Ocean, and Environmental 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. Must be taken concurrently with EVST 202L. QR, SC

* **G&G 141La / EVST 202La, Laboratory for Atmosphere, Ocean, and Environmental Change** Ronald Smith

Laboratory and field exercises to accompany EVST 201. Must be taken concurrently with EVST 201. SC ½ Course cr

* **G&G 205b, Natural Resources and Their Sustainability** Jay Ague

The formation and distribution of renewable and nonrenewable energy, mineral, and water resources. Topics include the consequences of extraction and use; depletion and the availability of substitutes; and economic and geopolitical issues. Recommended preparation: introductory chemistry and geology. SC

G&G 211b / EVST 211b / HIST 143b / HSHM 211b, Catastrophe and the Earth Sciences since 1850 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 216, **Global Warming: Climate Physics**][G&G 220, **Petrology and Mineralogy**]**G&G 232b, Paleoenvironments** Noah Planavsky and Mark Brandon

Introduction to sedimentary rocks as paleoenvironmental archives. Reconstruction of depositional environments and paleoclimatic conditions using geochemical and sedimentological tools. Topics include sedimentology, stratigraphy, basin analysis, diagenesis, and sedimentary geochemistry. Prerequisite: G&G 100, 110, or 115, or permission of instructor. SC

[G&G 235, **Geomorphology and Surface Processes**][G&G 240, **Forensic Geoscience**]**G&G 247b / AMTH 247b / MATH 247b, Partial Differential Equations** Stefan Steinerberger

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 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 274a, Fossil Fuels and Energy Transitions** Michael Oristaglio

The origins, geologic settings, exploration, distribution, and extraction of fossil fuels as finite Earth resources. Energy use today; transitions to future renewable resources. Topical issues include peak oil, deep-water exploration, carbon sequestration, and shale gas. 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 301a, Introduction to Geochemistry** Mark Pagani

Basic principles of geochemistry and their use in geological science. Thermodynamics of aqueous and igneous systems. Element fractionation and isotope geochemistry. Biogeochemical cycles, geochronology, cosmochemistry. After CHEM 161, 165, or 167 (or CHEM 115 or 118), and MATH 115; G&G 220 recommended. QR, SC

[G&G 310, Isotope Geochemistry]**[G&G 312, Structural Geology]****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 322a, Physics of Weather and Climate Trude Storelvmo

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 326b, Introduction to Earth and Planetary Physics** Jun Korenaga

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 327a / ENVE 327a / F&ES 327a, Atmospheric Chemistry Nadine Unger

The chemical and physical processes that determine the composition of the atmosphere; implications for climate, ecosystems, and human welfare. Origin of the atmosphere; photolysis and reaction kinetics; atmospheric transport of trace species; stratospheric ozone chemistry; tropospheric hydrocarbon chemistry; oxidizing power, nitrogen, oxygen, sulfur, and carbon cycles; interactions between chemistry, climate, and biosphere; aerosols, smog, and acid rain. Prerequisites: CHEM 161, 165, or 167 (or CHEM 115 or 118), and MATH 120, or equivalents. ENAS 194 recommended. 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 350a, Thermodynamics of Mountain Belts Jay Ague

The fundamental principles governing the formation of metamorphic and igneous rocks during mountain building. Topics include processes of heat and mass transfer in orogenic belts, generation of igneous rocks in continental and subduction settings, ultrahigh pressure and ultrahigh temperature metamorphism, spatial and temporal patterns of petrologic processes throughout geologic time, and pressure-temperature-time paths of metamorphic and igneous rocks. Prerequisites: G&G 220 or equivalent, MATH 120, and CHEM 161, 165, or 167 (or CHEM 115, 118); or with permission of instructor. SC RP

G&G 355a, Extraordinary Glimpses of Past Life Derek Briggs

Study of exceptionally well-preserved fossil deposits (*lagerstaetten*) that contain nonmineralized animal skeletons and casts of the soft parts of organisms. Examples such as the Burgess Shale and Solnhofen limestones; what they can reveal about the history and evolution of life, ancient lifestyles and environments, and preservational processes. After G&G 230. 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** Mark Pagani

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 David Bercovici

A survey of fluid dynamics, with applications to circulation in the ocean, atmosphere, mantle, and core. Mathematical models illustrate the fundamental dynamical principles of geophysical fluid phenomena such as convection, waves, boundary layers, flow stability, turbulence, and large-scale flows. After or concurrently with MENG 361 or equivalent and one course in meteorology or oceanography, or with permission of instructor. 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** David Bercovici

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** David Bercovici
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** David Bercovici
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** David Bercovici
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

Students in the Class of 2017 and subsequent classes who are considering a major in German Studies should refer to the program described under Germanic Languages and Literatures (p. 369). Students in the Class of 2016 may complete the German Studies major as described in previous editions of this bulletin (<http://www.yale.edu/printer/bulletin/archivepdf/files/YCPS>), or, with permission of the director of undergraduate studies, they may fulfill the requirements of the current German Studies major as described under Germanic Languages and Literatures (p. 369).

Germanic Languages and Literatures

Director of undergraduate studies: Kirk Wetters, 305 WLH, 432-0782, kirk.wetters@yale.edu; language program director: Theresa Schenker, 325 WLH, 432-0783, theresa.schenker@yale.edu; german.yale.edu

FACULTY OF THE DEPARTMENT OF GERMANIC LANGUAGES AND LITERATURES

Professors Rüdiger Campe (*Chair*), Carol Jacobs, Rainer Nägele, Paul North, Brigitte Peucker, Henry Sussman (*Visiting*), Kirk Wetters

Senior Lecturer II Marion Gehlker

Senior Lecturers Theresa Schenker, Howard Stern

Affiliated Faculty Jeffrey Alexander (*Sociology*), Seyla Benhabib (*Political Science*), David Cameron (*Political Science*), Paul Franks (*Philosophy, Judaic Studies*), Karsten Harries (*Philosophy*), Gundula Kreuzer (*Music*), Patrick McCreless (*Music*), Steven Smith (*Political Science*), David Sorkin (*History*), Nicola Suthor (*History of Art*), J. Adam Tooze (*History*), Katie Trumpener (*Comparative Literature, English*), Jay Winter (*History*)

The major in German Studies covers a broad tradition of more than five centuries in Switzerland, Austria, Germany, and neighboring lands. Students gain deep competence in the German language while also reading great literature, analyzing distinctive

artworks in many media, deducing intensive theories, and exploring political, linguistic, and cultural history. The German faculty works closely with undergraduates to develop their special areas of interest within these 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 third-largest economy in the world, and German is spoken by over 80 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.

The major The major in German Studies consists of ten term courses, including three advanced language courses, four courses in an area of concentration, and the senior essay. Students in the Class of 2016 majoring in German or German Studies may complete the requirements of the major in place when they entered it, as described in previous editions of this bulletin (<http://www.yale.edu/printer/bulletin/archivepdfs/YCPS>), or, with approval of the director of undergraduate studies, they may complete the requirements of the German Studies major as described below.

All majors must complete one GMAN course numbered in the 150s, one in the 160s, and one in the 170s, plus four additional advanced courses taught in German or in translation. Four courses in an area of concentration must be numbered above GMAN 170. With permission of the director of undergraduate studies, two courses related to German literature from other departments may be substituted for two required courses.

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 and two advanced courses taught in German. 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.

Senior essay Seniors in the standard German Studies major enroll in GMAN 492, a guided senior essay tutorial course. Students meet biweekly with the director of undergraduate studies 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 director of undergraduate studies by September 11, 2015; a three-page prospectus and a bibliography are due by September 25. A rough draft must be submitted to the adviser by November 6. The completed essay, due on December 11, 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 director of undergraduate studies by October 23, 2015. The student must submit a draft of at least fifteen pages of the essay by December 4 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 15, 2016. The senior essay is judged by the faculty adviser and a second reader.

Group A courses Courses in Group A (GMAN 110–169) include elementary, intermediate, and advanced language courses.

Group B courses Courses in Group B (GMAN 170 and above) are advanced courses and count toward the major. Readings are in German, and the language of instruction is usually German.

Group C courses Courses in Group C are conducted in English with texts in translation.

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 Web site (<http://german.yale.edu>) or from the office of the director of graduate studies.

Advising Candidates for the major in German Studies should consult the director of undergraduate 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 section K, Special Arrangements (p. 65), in the Academic Regulations. Students who study abroad for one term may count up to two courses toward the major, with approval of the director of undergraduate studies. Students who study abroad for an academic year may count up to four courses toward the major, with approval of the director of undergraduate studies.

Placement An online placement examination will be accessible July 1 through August 15, 2015. See the departmental Web site (<http://german.yale.edu/academics/undergraduate-program/language-program/placement-test>) for details. Students wishing to take the placement exam in January should sign up with the language director by December 4, 2015. Students may also consult with the director of undergraduate studies 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

Prerequisites First- and second-year German or equivalent.

Number of courses 10 (incl senior req)

Distribution of courses 1 GMAN course in the 150s, 1 in the 160s, and 1 in the 170s; 4 courses in area of concentration numbered above GMAN 170; 4 addtl advanced courses taught in German or in translation; *Literature concentration* – at least 1 course each in 19th- and 20th-century literature; 2 advanced courses taught in German

Substitution permitted With DUS approval, courses taken on Year or Term Abroad for other courses in major and up to 2 lit courses from other depts

Senior requirement Senior essay tutorial (GMAN 492)

Intensive major Two-term senior essay (GMAN 492 and 493)

Group A Courses

* **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. Credit only on completion of GMAN 120. 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 Howard Stern

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 Howard Stern

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 150a or b, Advanced German I** Marion Gehlker

An advanced language course intended to improve students' proficiency in aural and reading comprehension, as well as in speaking and writing. Discussion of literary texts by major German authors. Emphasis on vocabulary expansion with specialized grammatical review and a focus on stylistic development in students' writing. Recommended for students planning to use the language practically and as preparation for higher-level courses in both language and literature. 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

GMAN 160b, German Culture, History, and Politics in Text and Film Theresa Schenker

An advanced language course focused on improving upper-level language skills through the discussion of selected aspects of post-1945 German culture, politics, and history in literary and nonliterary texts and film. Includes oral and written assignments with an emphasis on vocabulary building and increased cultural awareness. After GMAN 140, 145, or 150. L5, HU

*** GMAN 162a, Contemporary German Culture** Theresa Schenker

Analysis and discussion of current social and cultural trends. Topics drawn from newspapers, films, TV series, cabaret, short literary texts, and talks. Focus on oral and written production to improve upper-level linguistic skills. Prerequisite: GMAN 150, or with permission of instructor. May not be taken for credit after GMAN 168. L5, HU

Group B Courses

*** GMAN 172b, Introduction to German Theater** Jason Kavett

An advanced language course that addresses key authors and works of the German theatrical tradition. Refinement of skills in reading comprehension, writing, and speaking. Authors include Lessing, Goethe, Schiller, Kleist, Büchner, Hebbel, Wedekind, Brecht, and Müller. L5, HU

*** GMAN 173a, Introduction to German Lyric Poetry** Sophie Elisa Ronzheimer

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 226a / LITR 218a, Faust** 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 Johnson, Goethe, Wilde, Bulgakov, and Thomas Mann. Screenings of films with a Faustian theme. HU

* **GMAN 240a / LITR 226a, German Modernism** Henry Sussman

Introduction to the radical innovations of modernism as it was forged, received, and revised in German-speaking Europe from c. 1880 to 1945. Literary experiments in dissonance and multifaceted suggestion; strategies in criticism and elucidation demanded by modernist works. Some attention to parallels in painting and music. Readings in English translation. Priority to German Studies majors. HU RP

* **GMAN 276a / LITR 423a, Satire, Irony, and Parody** Paul North

The uses and abuses of satire, irony, and parody as literary modes for social critique. Examination of the historical claim that antiquity uses satire, the romantic period uses irony, and the modernist period to the present uses parody for the purposes of critique. Readings include German and Austrian literature written from the eighteenth to the twenty-first centuries and classic works in the ancient Greek, Roman, English, Spanish, and American traditions. HU

GMAN 311b / LITR 215b, The Age of Goethe Staff

Introduction to Germany's "classical" period, from the 1790s to the 1830s, with attention to literature, philosophy, art, and culture. The close connection between literature and philosophy of the period; the theoretical foundations of European Romanticism and of later backlashes against it. Some attention to twentieth-century theory. WR, HU

* **GMAN 326a / LITR 248a, Franz Kafka and Thomas Mann** Jan Hagens

Comparison of Kafka's radical modernism and Mann's neoclassical realism as fundamentally different modes of responding to the challenges of twentieth-century culture. Close reading of short stories by both writers, with attention to the authors' themes, literary techniques, and worldviews. Discussion in English; readings in German or English. HU

* **GMAN 327b / LITR 229b, Around Kafka** Henry Sussman

Franz Kafka's writings viewed as a site for the radical questioning and dislocation of Western systems, institutions, and mores of the early twentieth century. Attention to the shorter fiction, the novels, the letters, and their strategic interrelations; examination of the fields of knowledge, ideological presumptions, and aesthetic and cultural experiments that Kafka touched, and to some degree deranged, with his writing. HU

TR

* **GMAN 333b / LITR 198b, Medieval German Lyric** Staff

Introduction to courtly poetry of the German High Middle Ages, from the twelfth through thirteenth centuries. Focus on the woman's voice as a performance device in the lyric of major artists. The language and formal conventions of lyric subgenres; development of the woman's role in the lyric of other European cultures. Readings and discussion in English; texts available in the original Middle High German. HU

* **GMAN 345b / LITR 344b, Fiction and Knowledge** Carol Jacobs

Fiction and related prose pieces in which the relationships between narration, fiction, understanding, and knowing play a critical role. Focus on works by Western writers

of the nineteenth through the twenty-first century. The texts' theoretical implications and implicit self-definitions; the import of concepts such as truth, fiction, self-consciousness, perception, science, and narrative. Readings and discussion in English; texts available in the original German or French. HU TR

* **GMAN 357b / LITR 433b / PHIL 225b, Nietzsche and His Readers** Paul North
Reading and discussion of Friedrich Nietzsche's major texts, as well as critiques and interpretations by some of his most influential twentieth-century readers. HU

* **GMAN 358a / JDST 345a / LITR 416a, Georg Lukács: Literature and Politics**
Hannan Hever
Literary-critical, aesthetic, political, and theoretical writings of Georg Lukács. Lukács as a Jewish thinker and Marxist critic; the development of his thought against the backdrop of twentieth-century history; his influence and reception in Germany, Israel, Austria, the United States, and the Soviet Union. HU

* **GMAN 362a / LITR 468a, The Question of Form** Carol Jacobs
The concept of art in relation to form and deformation. The Platonic tradition in *The Republic* and echoed in twentieth-century philosophy (Cassirer and Heidegger), modern literature (Keats, Hardy, Kleist, Poe, Kafka), and film (Godard, Egoyan, Dreyer, Sun Zhou, Wong Kar Wai). HU

* **GMAN 364b / LITR 429b, Illegitimacy** Kirk Wetters
Theoretical exploration of legitimacy as a fundamental historical, legal, and political concept; works by Weber, Schmitt, Blumenberg, and Luhmann. Literary readings on illegitimacy in the specific sense "born out of wedlock"; authors include Shakespeare, Goethe, Kleist, Dostoevsky, and Gide. Discussion in English; readings in German or English. HU, SO

* **GMAN 369b / FILM 358b / LITR 427b, Text and Image: The Double of Interpretation** Rüdiger Campe and Florian Fuchs
The textuality of vision and the visuality of text in the interpretation of artifacts in Western culture. The pairing of text and vision traced in literary and theoretical readings and in examples from visual art and film. Conditions, variations, and consequences of this unique media configuration and the politics of its interpretation. Case studies range from Plato to Hobbes, Kleist to Flaubert, and baroque emblems to computer diagrams. HU

* **GMAN 374b / LITR 307b, Walter Benjamin and the Modernization of Nineteenth-Century Paris** Henry Sussman
The radical modernization of Paris under the Second Empire (1851–70) as seen through the eyes of Walter Benjamin. Focus on Benjamin's *Arcades Project*, a compendium that charted developments such as Parisian mass transit and streamlined traffic, the construction of apartment houses, and the dissemination of mass media. Readings from other literary texts on the same events include works by Balzac, Zola, and Aragon. HU

GMAN 381b / PHIL 204b, Kant's Critique of Pure Reason Paul Franks
An examination of the metaphysical and epistemological doctrines of Kant's *Critique of Pure Reason*. PHIL 126 or DRST 004 HU

* **GMAN 416a / LITR 430a, Novels of the Institution** Rüdiger Campe
Close reading of novels of institutions—school, law court, administration, hospital—from c. 1900. The shift of focus from the individual to the institution; consequences

of this shift for the concept and form of the novel. Works by R. Walser, Joyce, Kafka, Musil, and Thomas Mann; readings in social and aesthetic theory by Simmel, Lukács, and Benjamin. Discussion in English; readings in German and English. HU

* **GMAN 456a / LITR 456a, Interpretation and Authority** Carol Jacobs
Close readings of works on problems of authority and interpretation by Sigmund Freud, Roland Barthes, Paul de Man, and Walter Benjamin. Exploration of their writing as a performance that questions simplistic notions of truth. Consideration of the problem of how to interpret texts that unsettle the very nature of interpretation. HU

Reading Courses

* **GMAN 100a, German for Reading** Marion Gehlker
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.

Senior Courses

* **GMAN 478a or b, Directed Readings or Individual Research in Germanic Languages and Literatures** Kirk Wetters
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** Kirk Wetters
Preparation of an original essay under the direction of a faculty adviser.

Global Affairs

Director of undergraduate studies: Susan Hyde, 101 Horchow Hall, 432-3418;
jackson.yale.edu/ba-degree

FACULTY ASSOCIATED WITH THE PROGRAM OF GLOBAL AFFAIRS

Professors Julia Adams (*Sociology*), Elizabeth Bradley (*Public Health*), John Gaddis (*History*), Jeffrey Garten (*School of Management*), Jacob Hacker (*Political Science*), Oona Hathaway (*Law School*), Phil Haun (*Adjunct*) (*Aerospace Studies*), Stathis Kalyvas (*Political Science*), Paul Kennedy (*History*), James Levinsohn (*Director*) (*School of Management*), Ellen Lust (*Political Science*), Mushfiq Mobarak (*School of Management*), Nicoli Nattrass (*Visiting*), Catherine Panter-Brick (*Anthropology*), W. Michael Reisman (*Law School*), Susan Rose-Ackerman (*Political Science, Law School*), Peter Schott (*School of Management*), Ian Shapiro (*Political Science*), Timothy Snyder (*History*), Aleh Tsyvinski (*Economics*), Christopher Udry (*Economics*), Steven Wilkinson (*Political Science*), Elisabeth Wood (*Political Science*), Ernesto Zedillo (*Center for the Study of Globalization*)

Associate Professors Costas Arkolakis (*Economics*), Patrick Cohrs (*History*), Ana De La O (*Political Science*), Alexandre Debs (*Political Science*), Susan Hyde (*Political Science*),

Kaveh Khoshnood (*Public Health*), Jason Lyall (*Political Science*), Nuno Monteiro (*Political Science*), Nancy Qian (*Economics*)

Assistant Professors David Atkin (*Economics*), Kate Baldwin (*Political Science*), Pia Rebello Britto (*Child Study Center*), Lorenzo Caliendo (*School of Management*), Lloyd Grieger (*Sociology*), Daniel Keniston (*Economics*), Adria Lawrence (*Political Science*), Thania Sanchez (*Political Science*), Tariq Thachil (*Political Science*), Jonathan Wyrzten (*Sociology*)

Senior Lecturers Charles Hill (*Humanities*), Douglas McKee (*Economics*), Justin Thomas

Lecturers Jasmina Besirevic-Regan (*Sociology*), Michael Boozer (*Economics*), Leslie Curry (*Public Health*), Robert Hopkins, Matthew Kocher (*Political Science*), Jean Krasno, Christine Leah (*International Security Studies*), John Negroponte, Michael Skonieczny (*Public Health*), Sean Smith, Edward Wittenstein

Senior Fellows Sigridur Benediktsdottir, David Brooks, Unni Karunakara, Michele Malvesti, Stanley McChrystal, Stephen Roach, Emma Sky

The Global Affairs major, administered by the Jackson Institute for Global Affairs, prepares Yale students for global citizenship and leadership 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.

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 Web site (<http://jackson.yale.edu/courses-2>).

Students in the Global Affairs major concentrate their course work in one of two tracks. The International Development track focuses on economic development and poverty, including global public health, in all but the world's wealthiest countries. The International Security track focuses on international relations, foreign policy, and diplomacy and includes topics relevant to national and human security. All majors are required to take a core course in each track and complete at least five additional courses in a single track.

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 and work toward the foreign language requirement early in their course planning.

Requirements of the major Twelve 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 for both tracks. All majors must take the core courses GLBL 225 and GLBL 275, and they must complete GLBL 121 prior to taking GLBL 225. Majors also take one research design course approved by the director of undergraduate studies.

Majors in the International Development track take intermediate microeconomics (ECON 121 or 125) and four electives in their area of concentration. Those in the International Security track take five electives in their area of concentration. Electives

must be chosen from an approved group of courses in Global Affairs, History (p. 394), Political Science (p. 561), Economics (p. 249), and other social science departments. For information about which courses qualify as electives within each track, see the Jackson Institute Web site (<http://jackson.yale.edu/global-affairs-major>) and the course listings in this bulletin.

Language requirement Global Affairs majors are required to take a course designated L₅ in a modern language. In exceptional cases, a demonstration of proficiency can fulfill this requirement.

Senior requirement In the fall term of the senior year, majors must complete a capstone project in GBLB 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.

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 Web site (<http://jackson.yale.edu/admission>), circulated through the residential college deans' offices, and noted on the Sophomore Web site (<http://sophomore.yalecollege.yale.edu>). For application information, visit the Jackson Institute Web site (<http://jackson.yale.edu/admission>).

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.

Study abroad Global Affairs majors who plan to study abroad should consult the director of student affairs, Cristin Siebert (cristin.siebert@yale.edu), to devise a course of study prior to the term abroad.

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.

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 12 (incl senior req; excluding lang req)

Specific courses required *Both tracks* – ECON 108, 110, or 115; ECON 111 or 116; GBLB 121, 225, 275; *International Development track* – ECON 121 or 125

Distribution of courses *Both tracks* – 1 course in research design; *International Development track* – 4 approved electives; *International Security track* – 5 approved electives

Language requirement Advanced ability (L₅) in 1 modern lang other than English

Senior requirement Senior capstone project in GBLB 499

Courses

GLBL 101a, Gateway to Global Affairs Michele Malvesti

Introduction to critical thinking about current international issues. Guest lecturers lead a series of modules, each on a global affairs topic in their area of expertise. Students learn to frame policy questions and write policy memos while examining competing points of view. Topics vary from year to year. SO

Global Affairs: Development

Global Affairs: Security

GLBL 121a or b, 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 186b / AFST 389b / MMES 181b / PLSC 389b, Middle East Exceptionalism**

Adria Lawrence

The Middle East and North Africa in comparative perspective. Evaluation of claims that the region's states are exceptionally violent, authoritarian, or religious. Themes include gender, Islam, nation and state formation, oil wealth, terrorism, and war. SO

Global Affairs: Research

* **GLBL 188a, Research Design for Global Affairs** Katharine Baldwin

Introduction to the methods used by social scientists to generate and answer questions about the world. How to formulate hypotheses about general concepts, design research projects to test hypotheses, and collect diverse types of data. Tools for designing an original research project or conducting a systematic evaluation of a program.

Prerequisite: GLBL 121.

* **GLBL 189a / HLTH 325a / LAST 416a, Methods and Ethics in Global Health**

Research Leslie Curry

Introduction to research methods in global health that recognize the influence of political, economic, social, and cultural factors. Quantitative, qualitative, and mixed-method approaches; ethical aspects of conducting research in resource-constrained settings; the process of obtaining human subjects' approval. Students develop proposals for short-term global health research projects conducted in resource-constrained settings. SO RP

Global Affairs: Research

* **GLBL 191a, Research Design and Survey Analysis** Justin Thomas

Introduction to research design through the analysis of survey data. Policy and management issues explored using data from the United States as well as from several developing countries. A bridge between the theory of statistics/econometrics and the practice of social science research. Use of the statistical package Stata. Prerequisites: GLBL 121 or equivalent, and an introductory course in statistics or econometrics. SO

* **GLBL 225b, Approaches to International Development** Daniel Keniston

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 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

Global Affairs: Development

GLBL 237a / ECON 185a, Debates in Macroeconomics Stephen Roach and Aleh

Tsyvinski

Introduction to current theoretical and practical debates in macroeconomics. In-class debates between the instructors on topics such as economic crises, fiscal and monetary policy, inflation, debt, and financial regulations. Prerequisites: introductory microeconomics and macroeconomics. SO

Global Affairs: Development

*** GLBL 243a / AFST 347a / EP&E 484a / LAST 348a / PLSC 347a, Post-Conflict**

Politics David Simon

Consideration of a range of issues and challenges faced by countries emerging from domestic conflict. Focus on elements of peace-building—disarmament and demobilization, post-conflict elections, institution-building, and reconstruction—as well as modes of transitional justice and mechanisms for truth and reconciliation. SO

GLBL 247b / PLSC 128b, Development under Fire Jason Lyall

The recent emergence of foreign assistance as a tool of counterinsurgency and post-conflict reconciliation. Evaluation of the effects of aid in settings such as Afghanistan, Iraq, Colombia, and the Philippines. Examination of both theory and practice of conducting development work in the shadow of violence. Strengths and weaknesses of different evaluation methods, including randomized control trials (RCTs) and survey experiments. SO

Global Affairs: Security

Global Affairs: Development

*** GLBL 275a or b, Approaches to International Security** Staff

Central topics and major approaches in the contemporary academic study of international security. Focus on the use of violence among and within states by both state and nonstate actors. Analysis of the potential and the shortcomings of current theoretical and empirical work. Not open to freshmen. Priority to Global Affairs majors. SO

GLBL 281a / HIST 221a, Military History of the West since 1500 Paul Kennedy

A study of the military history of the West since 1500, with emphasis on the relationship between armies and navies on the one hand, and technology, economics, geography, and the rise of the modern nation-state on the other. The coming of airpower in its varied manifestations. Also meets requirements for the Air Force and Naval ROTC programs. HU

Global Affairs: Security

* **GLBL 283b, Power, Strategy, and Security in the Asia-Pacific Region** Staff
Introduction to international security issues currently facing the Asia-Pacific region, including prospects for their management and resolution. SO

* **GLBL 302b / ECON 452b / EP&E 300b, Contemporary Issues in Energy Policy**
Ioannis Kessides

Overview of challenges in the global energy framework generated by concerns about energy security and climate change; public policies necessary for addressing these issues. Potential contributions and limitations of existing, improved or transitional, and advanced technologies. SO

Global Affairs: Development

* **GLBL 307b / ECON 467b, Economic Evolution of the Latin American and Caribbean Countries** Ernesto Zedillo

Economic evolution and prospects of the Latin American and Caribbean (LAC) countries. Topics include the period from independence to the 1930s; import substitution and industrialization to the early 1980s; the debt crisis and the "lost decade"; reform and disappointment in the late 1980s and the 1990s; exploration of selected episodes in particular countries; and speculations about the future.

Prerequisites: intermediate microeconomics and macroeconomics. SO

Global Affairs: Development

* **GLBL 310b / ECON 407b, International Finance** Konstantinos Arkolakis

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

Global Affairs: Development

* **GLBL 312b / EAST 454b / ECON 474b, Economic and Policy Lessons from Japan**
Stephen Roach

An evaluation of Japan's protracted economic problems and of their potential implications for other economies, including the United States, Europe, and China. Currency pressures, policy blunders, Abenomics, bubbles, and the global economic crisis of 2008; dangers to the global economy from a protracted postcrisis recovery period. Focus on policy remedies to avert similar problems in other countries.

Prerequisite: a course in macroeconomics. SO

Global Affairs: Development

* **GLBL 313a / AFST 360a / ECON 487a / EP&E 365a / PLSC 417a, The Political Economy of AIDS in Africa** Nicoli Natrass

The impact of and responses to the AIDS pandemic in Africa examined from a comparative perspective. Focus on South and southern Africa. Some background in social science and economics desirable. SO

* **GLBL 316b / ECON 462b / EP&E 228b / LAST 410b, The Economics of Human Capital in Latin America** Douglas McKee

Economic issues related to a population's education, skills, and health; focus on contemporary Latin American societies. Determinants of health and education; evaluation of human capital development policies; the role of human capital in a variety of economic contexts, including the labor market, immigration, child investment,

intra-household bargaining, inequality, and poverty. Prerequisites: intermediate microeconomics and econometrics. SO
Global Affairs: Development

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
Global Affairs: Development

* **GLBL 325a / ECON 469a / EP&E 470a, Health Inequality and Development** Staff
Economic analysis of the interactions between health, inequality, and development. Growth and development; health and well-being; burden of disease and funding for health; the relationship between growth and health; international health policy. Prerequisite: introductory microeconomics and macroeconomics. SO

* **GLBL 330a / ECON 465a / EP&E 224a, Debating Globalization** Ernesto Zedillo
Facets of contemporary economic globalization, including trade, investment, and migration. Challenges and threats of globalization: inclusion and inequality, emerging global players, global governance, climate change, and nuclear weapons proliferation. Prerequisite: background in international economics and data analysis. Preference to seniors majoring in Economics or EP&E. SO RP
Global Affairs: Development

* **GLBL 333a / EP&E 240a / PLSC 428a, Comparative Welfare Policy in Developing Countries** Jeremy Seekings
Examination of public and private welfare systems in the developing world. Analysis of the evolving relationships between kin or community and states and market. Particular attention to the politics of contemporary reforms. SO

* **GLBL 336b / EP&E 243b / LAST 423b / PLSC 423b, 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
Global Affairs: Development

* **GLBL 338b / EP&E 294b / PLSC 457b, Social Welfare and Nongovernmental Organizations** Katharine Baldwin
The role of nonstate actors such as religious organizations, community associations, and international NGOs in the delivery of basic goods and services in developing countries. Welfare states in Europe and North America and reasons why states outside these regions have not developed similar institutions; causes of and logic behind various nonstate actors' involvement in social welfare provision; economic, institutional, and political effects of having nonstate actors provide social services and public goods. SO
Global Affairs: Development

* **GLBL 339b / PLSC 383b, Political Parties in the Developing World** Tariq Thachil
Introduction to key issues surrounding political parties and party systems, with emphasis on the non-Western world. The formation of different kinds of parties;

ways in which political parties seek to forge links with ordinary citizens; the effects of parties' competition on democratic institutions. Examples drawn from countries in Latin America, Asia, the Middle East, and sub-Saharan Africa. SO

* **GLBL 345b, Humility** David Brooks

Traditions of modesty and humility in character building and political leadership. Contemporary understandings of character and character building. The premise that human beings are blessed with many talents but are also burdened by sinfulness, ignorance, and weakness. The concept of humility in works by and about Homer, Moses, Augustine, Montaigne, Burke, Niebuhr, Martin Luther King, Jr., and others.

HU

Global Affairs: Security

Global Affairs: Development

* **GLBL 361a / PLSC 436a, Violence: State and Society** Matthew Kocher

Examination of large-scale violence, generally within sovereign states. Why violence happens, why it takes place in some locations and not others, why it takes specific forms (insurgency, terrorism, civilian victimization), what explains its magnitude (the number of victims), and what explains targeting (the type or identity of victims). SO

Global Affairs: Security

* **GLBL 362b / AFST 373b / MMES 282b / SOCY 339b, Imperialism, Insurgency, and State Building in the Middle East and North Africa** Jonathan Wyrzten

The historical evolution of political order from Morocco to Central Asia in the past two centuries. Focus on relationships between imperialism, insurgency, and state building. Ottoman, European, and nationalist strategies for state building; modes of local resistance; recent transnational developments; American counterinsurgency and nation-building initiatives in the region. SO

Global Affairs: Security

* **GLBL 369a, Transatlantic Relations since 1989** Jolyon Howorth

The shifting relations between the United States and the European Union since the end of the Cold War. Root causes of convergence and divergence; political and security relations; economic and trade relations; sociocultural issues. SO

Global Affairs: Security

* **GLBL 380a / PLSC 429a, Political Violence** Stathis Kalyvas

A survey of research on the phenomenon of political violence, including riots, political assassinations, military coups, terrorism, civil wars, and certain types of organized crime. Connections between different forms of political violence; ways in which the rise and decline of each form shape the presence or absence of others. SO

* **GLBL 386a, The Politics of Human Rights Law** Thania Sanchez

The effects of international efforts to promote respect for human rights. Analysis of policy tools used by states, international organizations, and nongovernmental organizations to promote human rights work, including advocacy, law, sanctions, trade, aid, justice mechanisms, and diplomacy. Focus on issues such as genocide, torture, women's rights, children's rights, and civil and political rights. WR, SO

Global Affairs: Security

* **GLBL 388a, The Politics of Foreign Policy** Howard Dean

Domestic political considerations that have affected U.S. foreign policy since World War II. Historical and modern case studies include the Marshall Plan, the Bay of Pigs

and Cuban missile crisis, the Vietnam War, the opening of China, the Iran hostage crisis, the collapse of the USSR, the Iraq War, and the Keystone pipeline. SO
Global Affairs: Security

* **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. SO

Global Affairs: Security

* **GLBL 392a, Intelligence, Espionage, and American Foreign Policy** John Negroponte and 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.

Global Affairs: Security

* **GLBL 393b / ANTH 386b, Humanitarian Interventions: Ethics, Politics, and Health** Catherine Panter-Brick

Analysis of humanitarian interventions from a variety of social science disciplinary perspectives. Issues related to policy, legal protection, health care, morality, and governance in relation to the moral imperative to save lives in conditions of extreme adversity. Promotion of dialogue between social scientists and humanitarian practitioners. SO

* **GLBL 450a or b, Directed Research** Staff

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 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: Elizabeth Bradley, LEPH 300A, 785-2937; program adviser: Kaveh Khoshnood, LEPH 405, 785-2920; globalhealthstudies@yale.edu; ghi.yale.edu

GLOBAL HEALTH STUDIES ADVISORY COMMITTEE

Rene Almeling (*Sociology*), Elizabeth Bradley (*Chair*) (*Public Health*), Ivano Dal Prete (*History*), Mayur Desai (*Public Health*), Jane Edwards (*Yale College Dean's Office*), Marcia Inhorn (*Anthropology*), Kaveh Khoshnood (*Public Health*), Stephen Latham (*Political Science*), Catherine Panter-Brick (*Anthropology*), Joanna Radin (*History of Medicine*), Mark Saltzman (*Biomedical Engineering*), Michael Skonieczny (*Yale Global Health Leadership Institute*), Stephen Stearns (*Ecology & Evolutionary Biology*), Kristina

Talbert-Slagle (*Public Health*), Christian Tschudi (*Public Health*), Paul Turner (*Ecology & Evolutionary Biology*), John Wargo (*Forestry & Environmental Studies*)

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. Although not a major, the program offers courses through an interdisciplinary framework that brings together the natural sciences, the social sciences, and the humanities. Students choose a major in another department or program and expand their discipline with elective courses offered by Global Health Studies. Within their major, students may elect interdisciplinary concentrations and global health tracks to pursue an area of study that crosses conventional disciplinary and departmental boundaries. For details about course work, students should consult the director of undergraduate studies in their major.

Students desiring greater depth in the field are encouraged to apply to be a Global Health Fellow (<http://globalhealth.yale.edu/gh-fellows>). Global Health Fellows are usually selected in the fall of their sophomore year although, in exceptional cases, juniors may also be accepted. Fellows complete an interdisciplinary course of study that includes required and elective courses and fieldwork (e.g., internships with NGOs, or field-based research either with faculty or independently with faculty guidance). In the summer after the junior year, fellows conduct their own independent global health fieldwork, for which they receive support in the form of course work, designated funding, and mentorship from an assigned global health faculty adviser. During their senior year, fellows are expected to incorporate their global health fieldwork and classroom experiences into their senior requirement and to develop a publication-worthy written product.

To assist students in connecting classroom knowledge and skills with practical work in global health, the Global Health Studies program supports fellowships (<http://globalhealth.yale.edu/fellowships>) such as the Yale GHI: Field Experience Award, the Yale-Collaborative Action Project (Y-CAP), and the Yale College Fellowship for Research in Health Studies.

Qualified students may take graduate courses at the School of Public Health, subject to restrictions on graduate and professional school enrollment (p. 70) described in the Academic Regulations. Further information about these courses and other graduate offerings can be found in the School of Public Health bulletin (<http://www.yale.edu/printer/bulletin/htmlfiles/publichealth>). For information about the five-year B.A.–B.S./M.P.H. degree program offered jointly with the School of Public Health, see under Public Health (p. 593).

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 / DEVN 197b / SOCY 126b, Health of the Public: Medicine and Disease in Social Context 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 and Lyme disease. Biology of the pathogens including modes of transmission and establishment of infection; immune responses and the associated challenges to prevention and treatment. Intended for non-science majors; preference to freshmen and sophomores. Prerequisite: high school biology. sc

HLTH 230a, Global Health: Challenges and Responses Richard Skolnik

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. WR, so

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.

*** 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 251b / BENG 251b, Biological and Physiological Determinants of Health Mark Saltzman

Overview of the biological and physiological functions that lead to a state of health in an individual and in a population. Cellular and molecular mechanisms of health explored in the context of major sources of global disease burden. Key physiological

systems that contribute to health, including the endocrine, reproductive, cardiovascular, and respiratory systems. The development of technologies that enhance health and of those that harm it. Prerequisite: a college-level biology course or equivalent preparation. Does not fulfill premedical requirements. SC

* **HLTH 270a / CHLD 131a / EDST 131a, The Growing Child in Global Context** Erika Christakis

The effects of poverty, changing demographic and workforce trends, and access to early education and child care on the growing child around the world. Topics include antenatal care, mental and behavioral health, malnutrition and obesity, family support, schooling, sex selection and gender bias, parenting practices, migration and warfare, and child policy challenges in diverse cultural and socioeconomic contexts. SO

HLTH 280b / HIST 146b / HSHM 212b, Historical Perspectives on Global Health Joanna Radin

The broader historical context of contemporary practices, policies, and values associated with the concept of global health. Historical formations around ideas about disease, colonialism, race, gender, science, diplomacy, security, economy, and humanitarianism; ways in which these formations have shaped and been shaped by attempts to negotiate problems of health and well-being that transcend geopolitical borders. HU

* **HLTH 325a / GLBL 189a / LAST 416a, Methods and Ethics in Global Health Research** Leslie Curry

Introduction to research methods in global health that recognize the influence of political, economic, social, and cultural factors. Quantitative, qualitative, and mixed-method approaches; ethical aspects of conducting research in resource-constrained settings; the process of obtaining human subjects' approval. Students develop proposals for short-term global health research projects conducted in resource-constrained settings. SO RP

* **HLTH 330b, Case Studies in Global Health** Richard Skolnik

Exploration of three important themes in the study of global health: efforts to eradicate communicable disease, attempts to reform health systems, and investments to achieve more equity and equality in health services delivery. Case studies examined from historical, economic, technical, epidemiological, political, sociological, and managerial perspectives. Prerequisite: HLTH 230 or equivalent, or with permission of instructor. WR, SO

* **HLTH 370b / ER&M 360b / HSHM 432b / SOCY 390b / WGSS 390b, Politics of Reproduction** Rene Almeling

Reproduction as a process that is simultaneously biological and social, involving male and female bodies, family formation, and powerful social institutions such as medicine, law, and the marketplace. Sociological research on reproductive topics such as pregnancy, birth, abortion, contraception, infertility, reproductive technology, and aging. Core sociological concepts used to examine how the politics of reproduction are shaped by the intersecting inequalities of gender, race, class, and sexuality. WR, SO

* **HLTH 444b, Biology, Pathogenesis, and Natural History of HIV/AIDS** Kristina Talbert-Slagle

Study of HIV/AIDS from the perspectives of molecular biology, immunology, sociology, history, and epidemiology. Enrollment limited to 18. Prerequisites: BIOL 101, 102, 103, and 104, or with permission of instructor.

* **HLTH 480b / E&EB 460b, Studies in Evolutionary Medicine I** Stephen Stearns
Principles of evolutionary biology applied to issues in medical research and practice. Lactose and alcohol tolerance; the "hygiene hypothesis"; genetic variation in drug response and pathogen resistance; spontaneous abortions, immune genes, and mate choice; the evolution of aging; the ecology and evolution of disease; the emergence of new diseases. Students develop proposals for research to be conducted during the summer. Admission by competitive application; forms are available on the EEB Web site (<http://www.eeb.yale.edu>). SC

* **HLTH 481a / E&EB 461a, Studies in Evolutionary Medicine II** Paul Turner
Continuation of E&EB 460. Prerequisite: E&EB 460 or permission of instructor. SC

* **HLTH 490a, Global Health Research Colloquium** Kristina Talbert-Slagle and Elizabeth Bradley

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

* **AFST 401a, Research Methods in African Studies** Cheryl Doss

Disciplinary and interdisciplinary research methodologies in African studies, with emphasis on field methods and archival research in the social sciences and humanities. Research methodologies are compared by studying recent works in African studies.

* **ANTH 386b / GLBL 393b, Humanitarian Interventions: Ethics, Politics, and Health**
Catherine Panter-Brick

Analysis of humanitarian interventions from a variety of social science disciplinary perspectives. Issues related to policy, legal protection, health care, morality, and governance in relation to the moral imperative to save lives in conditions of extreme adversity. Promotion of dialogue between social scientists and humanitarian practitioners. SO
Anthropology: Sociocultural

* **ANTH 451a / WGSS 431a, 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
Anthropology: Sociocultural

* **ANTH 455a / WGSS 459a, Masculinity and Men's Health** Marcia Inhorn
Ethnographic approaches to masculinity and men's health around the globe. Issues of ethnographic research design and methodology; interdisciplinary theories of

masculinity; contributions of men's health studies from Western and non-Western sites to social theory, ethnographic scholarship, and health policy. SO RP
 Anthropology: Sociocultural

BENG 100b, Frontiers of Biomedical Engineering Staff

The basic concepts of biomedical engineering and their connection with the spectrum of human activity. Introduction to the fundamental science and engineering on which biomedical engineering is based. Topics include genetic engineering, cell culture engineering, vaccines, drug discovery and delivery, cardiovascular physiology, biomechanics, and biomedical imaging. Designed for science and non-science majors. SC

* **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 325a, Economics of Developing Countries Nancy Qian

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. After introductory microeconomics and econometrics. SO

ECON 327b, The Economics of Poverty Alleviation Dean Karlan

Measures that succeed and fail—and why—in the fight against poverty in developing countries. Fundamentals of behavioral economics and their application to policy and program design. When and how to use experimental methods to evaluate ideas and programs. Interventions and policies that apply to households, small firms, and communities, with particular attention to microfinance, health, and education. After introductory microeconomics and econometrics. WR, SO

* **ECON 461b, Economics, Addiction, and Public Policy** Jody Sindelar

Smoking, alcoholism, illicit drugs, and obesity studied from economic and policy perspectives. Focus on causes of and solutions to problems. After introductory microeconomics. SO

* **ECON 462b / EP&E 228b / GLOBL 316b / LAST 410b, The Economics of Human Capital in Latin America** Douglas McKee

Economic issues related to a population's education, skills, and health; focus on contemporary Latin American societies. Determinants of health and education; evaluation of human capital development policies; the role of human capital in a variety of economic contexts, including the labor market, immigration, child investment,

intra-household bargaining, inequality, and poverty. Prerequisites: intermediate microeconomics and econometrics. SO

* **ECON 464a / AFST 464a, The Economics of Africa** Cheryl Doss

Study of key microeconomic issues facing African economies and of the economic tools used to analyze such issues. Topics include infrastructure, land, agriculture, conflict, intra-household issues, health and education, microfinance and risk, and coping strategies. Readings from recent literature in microeconomic development. Prerequisites: intermediate microeconomics and econometrics. SO

ENVE 441a, Biological Processes in Environmental Engineering Jordan Peccia

Fundamental aspects of microbiology and biochemistry, including stoichiometry, kinetics, and energetics of biochemical reactions, microbial growth, and microbial ecology, as they pertain to biological processes for the transformation of environmental contaminants; principles for analysis and design of aerobic and anaerobic processes, including suspended- and attached-growth systems, for treatment of conventional and hazardous pollutants in municipal and industrial wastewaters and in groundwater. Prerequisites: CHEM 161, 165, or 163, 167 (or CHEM 112, 113, or 114, 115, or 118); MCDB 290 or equivalent; or with permission of instructor. SC

* **EP&E 271b / AFST 447b / ER&M 271b / PLSC 447b, The Rwandan Genocide in Comparative Context** David Simon

An examination of the 1994 Rwandan genocide: historical sources of the conflict, the motivations of the killers, actions and reactions of outside actors, efforts to reconstruct a post-genocide society, and continuation of the genocidal dynamic within the Great Lakes region. Consideration of other countries in similar situations, as well as other genocides in recent decades. SO

EP&E: Social Theory Core

* **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

* **HSHM 437b / HIST 435Jb, The Global Crisis of Malaria** Frank Snowden

The global crisis of malaria examined in comparative and historical context. The mosquito theory of transmission and other developments in scientific understanding of the disease; World Health Organization strategies to eradicate malaria since 1955; the development of tools such as insecticides, medication, and bed nets; the attempt to create an effective vaccine. WR, HU

* **HUMS 076a / HSHM 007a, Epidemics in Global Perspective** William Summers

Interaction of epidemic diseases and society. The response of government, medicine, and the public to the threat or actual presence of widespread contagious diseases. The notion of major epidemics as one of the key contingencies of history, critically examined through contemporary medical, political, and literary accounts. The changing responses of societies and governments to epidemics as well as the reasons for those responses. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU, SO

*** 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 freshmen. Preregistration required; see under Freshman Seminar Program. SC RP

MCDB 290b, Microbiology Christine Jacobs-Wagner

Cell structure of microorganisms, bacterial genetics, microbial evolution and diversity, microbial development, microbial interaction, chemotaxis and motility, gene regulation, microbial genomics, host defense systems, infectious diseases, viruses, and biological weapons. Prerequisites: BIOL 101 and 102, or a term of biochemistry, genetics, cell biology, or molecular biology. SC

*** MENG 491b, Appropriate Technology and the Developing World** Joseph Zinter

Introduction to user-centered design through exploration of appropriate technology, a class of solutions that solve a particular need and are viable and sustainable within the environmental, economic, cultural, and technological infrastructure for which they are intended. Focus on technologies for use in the developing world. Student design teams conceptualize, ideate, prototype, and generate a commercialization plan for a real-world appropriate technological device. RP

PLSC 248a, Political Economy of Health Care Peter Swenson

Political and economic factors that have influenced efforts to achieve quality, economy, and equality in the delivery of American health care since the early twentieth century; some attention to international comparisons. Medical licensing; drug regulation; malpractice law; provider payment and care management; guaranteed health insurance; emergence of the private, employer-based insurance system; recent legislative actions and controversies concerning the quality and cost-effectiveness of health care. Recommended preparation: introductory microeconomics. 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 446b / EP&E 258b / SOCY 369b, Welfare States across Nations** Sigrun Kahl

How different societies counterbalance capitalism and deal with social risks. Welfare state regimes and their approaches to inequality, unemployment, poverty, illness, disability, child rearing, and old age. Why the United States has an exceptionally small welfare state. SO

*** PSYC 355a, Clinical Psychology in the Community** Kristi Lockhart

Mental disorders as they are treated within a community setting. Students participate in a fieldwork placement, working either one-on-one or in groups with the psychiatrically disabled. Seminar meetings focus on such topics as the nature of severe mental disorders, the effects of deinstitutionalization, counseling skills, and social policy issues related to mental health. Prerequisite: PSYC 180 or permission of instructor.

Psychology: Social Science

Hellenic Studies

Directors: Stathis Kalyvas, 201 RKZ, 432-5386, stathis.kalyvas@yale.edu; John Geanakoplos, 30 Hillhouse Ave., 432-3397, john.geanakoplos@yale.edu; program administrator: George Syrimis, 34 Hillhouse Ave., 432-9342, george.syrimis@yale.edu; www.yale.edu/macmillan/hsp

FACULTY ASSOCIATED WITH THE PROGRAM OF HELLENIC STUDIES

Professors John Geanakoplos (*Economics*), Stathis Kalyvas (*Political Science*)

Lecturer George Syrimis

Senior Lector Maria Kaliambou

Hellenic Studies is a program of the Council on European Studies. 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 (p. 192). 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.

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. Credit only on completion of MGRK 120. 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. Course includes students from Cornell University via videoconference. 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. Course includes students from Cornell University via videoconference. L4 1½ Course cr

* **MGRK 216a / CLCV 216a / LITR 239a, 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 234a / LITR 347a, Surveillance, Paranoia, and the Modern State** George Syrimis

Cultural and artistic reactions to the collection and control of information and the tension that arises between these practices and liberal claims to privacy rights. Focus on literary and cinematic works. The control of information as manifested in the technologies of behaviorism; the political and economic regimes of totalitarianism; liberal democracy and corporate capitalism; theoretical speculation about the relationship between writers and authors and spectators and their objects. HU

* **MGRK 300b / CLCV 319b / HIST 242Jb / WGSS 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

* **MGRK 303b / PLSC 392b, The Greek Civil War** Stathis Kalyvas

An in-depth look into the Greek civil war, one of the major European civil wars of the twentieth century, including its relation to World War II and the Cold War. Focus on readings from the field of history, with some attention to other disciplines and areas such as anthropology and fiction. SO

* **MGRK 481a and MGRK 482b, Independent Tutorial** Staff

For students with advanced language skills in modern Greek who wish to engage in individual study or concentrated reading and research on material not otherwise offered in courses. Applicants submit a detailed project proposal to the associate program chair. The student must meet with the instructor for at least one hour each week, and the work must terminate in a term paper or its equivalent.

History

Director of undergraduate studies: Beverly Gage, 238 HGS, beverly.gage@yale.edu; history.yale.edu

FACULTY OF THE DEPARTMENT OF HISTORY

Professors Jean-Christophe Agnew, Abbas Amanat, Ned Blackhawk, David Blight, Daniel Botsman, Paul Bushkovitch, George Chauncey, Carolyn Dean, John Demos (*Emeritus*), Carlos Eire, John Mack Faragher, Paul Freedman, Joanne Freeman, John Gaddis, Beverly Gage, Glenda Gilmore, Bruce Gordon, Valerie Hansen, Robert Harms, Jonathan Holloway, Matthew Jacobson, Gilbert Joseph, Paul Kennedy, Benedict Kiernan, Jennifer Klein, Naomi Lamoreaux (*Chair*), Bentley Layton, Noel Lenski, Kathryn Lofton, Mary Lui, Joseph Manning, Ivan Marcus, John Merriman, Joanne Meyerowitz, Alan Mikhail, Nicholas Parrillo, Peter Perdue, Steven Pincus, Stephen Pitti, Naomi Rogers, Sophia Rosenfeld, Lamin Sanneh, Stuart Schwartz, Frank Snowden, Timothy Snyder, David Sorkin, Harry Stout, William Summers, Francesca Trivellato, John Warner, Anders Winroth, John Witt, Keith Wrightson

Associate Professors Paola Bertucci, Patrick Cohrs, Fabian Drixler, Crystal Feimster, Andrew Johnston, Daniel Magaziner, Edward Rugemer, Paul Sabin, Marci Shore, Eliyahu Stern

Assistant Professors Jennifer Allen, Rosie Bsheer, Henry Cowles, Rohit De, Alejandra Dubcovsky, Marcela Echeverri, Anne Eller, Denise Ho, Isaac Nakhimovsky, Joanna Radin, William Rankin, Julia Stephens, Jenifer Van Vleck, Jonathan Wyrzten

Senior Lecturers Annping Chin, Becky Conekin, Stuart Semmel, Rebecca Tannenbaum

Lecturers Adel Allouche, Amanda Behm, Raymond Clemens, Ivano Dal Prete, Kjell Ericson, Jeremy Friedman, Jay Gitlin, George Levesque, William Metcalf, Chitra Ramalingam, Terence Renaud, Ariel Ron, William Summers

The History major is for students who understand that shaping the future requires knowing the past. History courses explore 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.

Course numbering Courses numbered HIST 001 to 099 are freshman seminars, with enrollment limited to eighteen. 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.

The major History majors choose one of two tracks. 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. 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.

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 for the Class of 2016 Students in the Class of 2016 may fulfill the requirements of the History major that were in place when they entered the major, as described in previous editions of this bulletin (<http://www.yale.edu/printer/bulletin/archivepdf/files/YCPS>). (Members of the Class of 2017 who declared the major

prior to April 2015 may choose to fulfill the Class of 2016 requirements, with special permission of the director of undergraduate studies.)

Requirements of the major for the Class of 2017 and subsequent classes Ten term courses in History are required, in addition to the senior essay. No specific courses are required. Upon declaration, all History majors select either the Global or the Specialist track. Majors may change tracks until the end of course selection period in the first term of the senior year.

The Global track requires one course each in 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 136J).

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 History department Web site (<http://history.yale.edu/academics/undergraduate-program/pathways>). Students must also take at least two courses outside their area of specialization, and their overall coursework 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 136J). Students in the Specialist track may design an area of specialization with the approval of a faculty adviser and the director of undergraduate studies.

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 136J). 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.

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 is wide, but most essays fall into two categories. The first involves the study of a significant historical subject through research in

accessible primary source materials. The second is a critical assessment of a significant historical controversy or historiographical issue.

Most students choose to complete a two-term independent senior essay, for a total of twelve course credits in the major. The two-term essay is required to earn Distinction in the Major. A smaller number of students choose to write a one-term essay within the context of a third departmental seminar, for a total of eleven course credits in the major.

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 department Web site (<http://history.yale.edu/academics/undergraduate-program/senior-departmental-essay>).

The one-term senior essay History majors may choose to write a senior essay in the context of an additional departmental seminar (for a total of three departmental seminars). Students who elect this option consult with the seminar instructor to determine an appropriate balance between seminar and essay requirements. The final project must include a substantial research paper based on primary sources, along with a bibliographic essay. Students who choose the one-term senior essay option are not eligible for Distinction in the Major. Additional details about the senior essay are provided in the Senior Essay Handbook, available on the History department Web site (<http://history.yale.edu/academics/undergraduate-program/senior-departmental-essay>).

Additional options for the senior essay Some students embark on the two-term essay but discover that their choice is not a good fit. Other students begin a one-term essay only to discover that they are passionate about the subject and wish to expand their paper in a second term of independent research. To accommodate such students, the History major offers both an "opt-in" and an "opt-out" clause for the two-term senior essay. Students who begin the year by writing a research paper in the context of a seminar may "opt in" to the two-term essay by enrolling in HIST 496 during the second term of the senior year, with the permission of the faculty adviser and the senior essay director. Students who enroll in HIST 495 during the first term may "opt out" (by their own decision, or the decision of their faculty adviser) and instead enroll in a third departmental seminar during the second term of the senior year. Students who "opt out" will not be eligible for Distinction in the Major. Additional details about the senior essay are provided in the Senior Essay Handbook, available on the History department Web site (<http://history.yale.edu/academics/undergraduate-program/senior-departmental-essay>).

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 director of undergraduate studies. Students may request a specific adviser in consultation with the director of undergraduate studies, 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 director of undergraduate studies. Nondepartmental courses may fulfill geographic, region/pathway, and preindustrial distribution requirements. They may not fulfill departmental seminar or senior requirements.

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 Honors (p. 31) in the Undergraduate Curriculum (p. 18) section of this bulletin.) Students who do not complete the two-term senior essay are not eligible for Distinction.

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 "Simultaneous Award of the Bachelor's and Master's Degrees" under Special Arrangements, section K (p. 65), in the Academic Regulations (p. 33). Interested students should consult the director of undergraduate studies 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; 2 departmental sems; *Global track*—1 course in each of 5 geographic regions (U.S., Europe, Asia, Latin America, Africa/Middle East); *Specialist track*—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 essay in a third departmental seminar.

Freshman Seminars

*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 013b / LING 010b, Language and Power** Claire Bowern and Alejandra Dubcovsky-Joseph

The relationships between language and power explored through the perspectives of linguistics and history. How and when languages change, disappear, and are created. Focus on the Americas and on four outcomes of language contact and their social precursors: pidgins, creoles, mixed languages, and language death. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. SO

* **HIST 015b, History of Food and Cuisine** Paul Freedman

The history of food from the Middle Ages to the present, with a focus on the United States and Europe. How societies gathered and prepared food; culinary tastes of different times and places. The influence of taste on trade, colonization, and cultural exchange. The impact of immigration, globalization, and technology on food. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU

* **HIST 016b / AFAM 060b / AMST 060b, Significance of American Slavery** Edward Rugemer

The history of American slavery, its destruction during the nineteenth century, and its significance today. Topics include the origins of slavery, the development of racism, the transatlantic slave trade, the experience of enslavement, resistance to slavery, the abolitionist movement, the process of emancipation, and the perpetuation of slavery and other forms of unfree labor in the twenty-first century. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **HIST 018a / AMST 019a, Commodities as U.S. History** Matthew Jacobson

American social, cultural, and political history introduced through study of the production, distribution, and consumption of common commodities. Topics include political economy, slavery, industrialization, labor, the rise of the corporation, the growth of the administrative and regulatory state, geopolitics, foreign policy, and cultural change. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. RP

* **HIST 020b / ARCG 020b / CLCV 050b / EVST 030b / NELC 026b, Rivers and Civilization** Joseph Manning and 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. Includes a week-long field trip to Turkey. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU, SO

* **HIST 021a / CLCV 057a, The Age of Constantine** Noel Lenski

The world of late antiquity explored through the pivotal figure of Constantine the Great, Rome's first Christian ruler. Focus on the third and fourth centuries C.E. Themes of politics, religion, society and economy, history of art and architecture, warfare, administration, foreign policy, and multiculturalism. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **HIST 030a / EAST 030a, Tokyo** Fabian Drixler

Four centuries of Japan's history explored through the many incarnations, destructions, and rebirths of its foremost city. Focus on the solutions found by Tokyo's residents to the material and social challenges of concentrating such a large population in one place. Tensions between continuity and impermanence, authenticity and modernity, and social order and the culture of play. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **HIST 032a / EAST 032a, Shanghai** Denise Ho

History of the city of Shanghai, with a focus on how Shanghai has been seen and what its experience reveals about modern China. Shanghai's unique place in imagining China; its transformation in the nineteenth century from a fishing village to an international "treaty port" and China's gateway to the West; twentieth-century Shanghai as a site of innovation, from politics and capitalism to media and fashion; the city's vilification in the early Mao years and later reemergence as a symbol of China's modernization. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **HIST 033b / WGSS 033b, 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 freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **HIST 042a, Oil and Empire** Rosie Bsbeer

The political and social history of oil since the late nineteenth century, including global trends and processes. Oil's impact on the rise and fall of empires and the fates of nation-states; its role in war and its impact on social and cultural life. Focus on the Middle East, with some attention to Venezuela, Indonesia, and the Niger Delta. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **HIST 045a, The Holocaust and Its Afterlives** Jennifer Allen

The history and memory of the Holocaust in Germany. How the Holocaust itself unfolded, and how Germany has worked through its legacy. Guilt and complicity, the logic of the concentration camps, the limits of totalitarianism, the representations of horror, the prosecution of atrocity, Holocaust memory across generations, and Germany's urban memory landscape. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **HIST 070a, Lawyers as Rebels** Rohit De

Examination of how lawyers have worked in illiberal and unjust legal systems. Key themes in global history of the twentieth century, such as imperialism, nationalism, apartheid, holocaust, civil rights, communism, feminism, and LGBT rights. Case studies include Gandhi, Mandela, Hersch Lauterpacht, Pauli Murray, and Asma Jahangir. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU

* **HIST 072b, 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. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. WR, HU RP

Lecture Courses

HIST 103a, America before the Revolution Alejandra Dubcovsky-Joseph

Life in America before the American Revolution, focusing on war, politics, race relations, religion, and culture. The ways in which encounters, conflicts, and compromises among Native Americans, Africans, and Europeans shaped North American society. HU

HIST 107a / AMST 133a / ER&M 187a, Introduction to American Indian History

Ned Blackhawk

Survey of American Indian history, beginning with creation traditions and migration theories and continuing to the present day. Focus on American Indian nations whose homelands are located within the contemporary United States. Complexity and change within American Indian societies, with emphasis on creative adaptations to changing historical circumstances. WR, HU

History: Preindustrial

HIST 112a / AMST 190a, The Formation of Modern American Culture, 1876–1919

Jean-Christophe Agnew

An introduction to the cultural history of the United States from Reconstruction through the First World War, with special attention to the persistence of popular culture, the transformation of bourgeois culture, and the birth of mass culture during a period of rapid industrialization. HU

HIST 116b, The American Revolution Joanne Freeman

The American Revolution from the perspective of the colonists; their shifting identities as English subjects, colonial settlers, revolutionaries, and Americans. Readings include contemporary correspondence and eyewitness accounts. HU

History: Preindustrial

HIST 118a / CGSC 135a / HSHM 216a / PSYC 135a, Minds and Brains in America

Henry Cowles

A survey of the science and medicine of mind and brain in America since 1800. Madness and the asylum; phrenology and psychoanalysis; psychology in politics, law, and advertising; the rise of the "neuro-" disciplines; mental health in public life. Texts from fields such as neurology, physiology, psychology, psychiatry, and philosophy. May not be taken after HSHM 409. WR, 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 120b / AMST 163b / EVST 120b / HSHM 204b, American Environmental History Paul Sabin

Ways in which people have shaped and been shaped by the changing environments of North America from precolonial times to the present. Migration of species and trade

in commodities; the impact of technology, agriculture, and industry; the development of resources in the American West and overseas; the rise of modern conservation and environmental movements; the role of planning and impact of public policies. WR, HU

HIST 122b / AMST 193b, Origins of U.S. Global Power Jenifer Van Vleck
Policies, strategies, and ideas that enabled the United States to become a world power. Manifest Destiny, expansion, and empire; American exceptionalism; nationalism and internationalism; capitalism and consumer culture; technological innovation; the relation between domestic politics and U.S. foreign policy, particularly with regard to race and gender; challenges and resistance to U.S. global power. Focus on the twentieth century, with introduction to critical moments in U.S. and international history during the seventeenth through nineteenth centuries. HU

HIST 127a / AMST 135a / WGSS 200a, U.S. Lesbian and Gay History George Chauncey

Introduction to the social, cultural, and political history of lesbians, gay men, and other socially constituted sexual minorities. Focus on understanding categories of sexuality in relation to shifting normative regimes, primarily in the twentieth century. The emergence of homosexuality and heterosexuality as categories of experience and identity; the changing relationship between homosexuality and transgenderism; the development of diverse lesbian and gay subcultures and their representation in popular culture; religion and sexual science; generational change and everyday life; AIDS; and gay, antigay, feminist, and queer movements. HU

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 John Mack Faragher

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 143b / EVST 211b / G&G 211b / HSHM 211b, Catastrophe and the Earth Sciences since 1850 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 146b / HLTH 280b / HSHM 212b, Historical Perspectives on Global Health Joanna Radin

The broader historical context of contemporary practices, policies, and values associated with the concept of global health. Historical formations around ideas about disease, colonialism, race, gender, science, diplomacy, security, economy, and humanitarianism; ways in which these formations have shaped and been shaped by attempts to negotiate problems of health and well-being that transcend geopolitical borders. HU

HIST 183a / AMST 272a / ER&M 282a / WGSS 272a, Asian American History, 1800 to the Present Mary Lui

An introduction to the history of East, South, and Southeast Asian migrations and settlement to the United States from the late eighteenth century to the present. Major themes include labor migration, community formation, U.S. imperialism, legal exclusion, racial segregation, gender and sexuality, cultural representations, and political resistance. HU

HIST 184b / AFAM 160b / AMST 160b, 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 187a / AFAM 162a / AMST 162a, African American History from Emancipation to the Present Jonathan Holloway

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 206b, The Middle Ages, 300–1500 Paul Freedman

Introduction to the European Middle Ages. Topics include Rome's decline, the rise of Christianity, the spread of Islam, Charlemagne, Viking attacks, wars and the Crusades, the commercial revolution, saints, the culture of chivalry, the papacy, the invention of universities, the foundations for modern law, and early journeys of discovery. May not be taken after HIST 210 or 211. WR, HU

History: Preindustrial

*** HIST 215b / RLST 283b, Reformation Europe, 1450–1650** Bruce Gordon

Examination of a series of religious revolutions in Europe between 1450 and 1650. The causes and nature of the reformations that changed the religious, political, social, and economic landscapes of early modern Europe and shaped the course of Western civilization as a whole. HU

History: Preindustrial

HIST 216a / JDST 332a / MMES 197a / RLST 193a, Zionism Shaun Halper

Introduction to the core ideas of the Zionist movement from the mid-nineteenth century to the mid-twentieth. Focus on internal Jewish debates and criticism of the movement by European and Middle Eastern intellectuals. Social, political, cultural, and messianic ideological strands within the movement and their interpretations of various historical experiences and ideas located in the Jewish tradition. HU

History: Preindustrial

HIST 217a / CLCV 206a, 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

History: Preindustrial

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

History: Preindustrial

HIST 219a / ER&M 219a / JDST 200a / MMES 149a / RLST 148a, Jewish History and Thought to Early Modern Times Ivan Marcus

A broad introduction to the history of the Jews from biblical beginnings until the European Reformation and the Ottoman Empire. Focus on the formative period of classical rabbinic Judaism and on the symbiotic relationships among Jews, Christians, and Muslims. Jewish society and culture in its biblical, rabbinic, and medieval settings. Counts toward either European or non-Western distributional credit within the History major, upon application to the director of undergraduate studies. HU RP

History: Preindustrial

HIST 220b / JDST 201b / RLST 149b, History of Jewish Culture, 1500 to the Present

David Sorkin

A broad introduction to the history of Jewish culture from the late Middle Ages until the present. Emphasis on the changing interaction of Jews with the larger society as well as the transformation of Judaism in its encounter with modernity. HU

History: Preindustrial

HIST 221a / GLBL 281a, Military History of the West since 1500 Paul Kennedy

A study of the military history of the West since 1500, with emphasis on the relationship between armies and navies on the one hand, and technology, economics, geography, and the rise of the modern nation-state on the other. The coming of airpower in its varied manifestations. Also meets requirements for the Air Force and Naval ROTC programs. HU

HIST 223b, Renaissance Italy Francesca Trivellato

Renaissance Italy as the cradle of Western modernity. Great figures of the Italian Renaissance, including the Medici, Brunelleschi, and Machiavelli; the ordinary lives of men and women during the period. Topics include the rise of city-states, the commercial revolution, war and state-building, humanism, family and gender relations, encounters with Jews and Muslims, court society, and the visual arts. HU

History: Preindustrial

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 229a, From Oligarchy to Democracy in Britain, 1750–1914 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 237b / RSEE 390b / RUSS 241b, Russian Culture: The Modern Age Paul Bushkovitch

An interdisciplinary exploration of Russian cultural history, focusing on literature, art, religion, social and political thought, and film. Conceptions of Russian nationhood; the myths of St. Petersburg; dissent and persecution; the role of social and cultural elites; the intelligentsia; attitudes toward the common people; conflicting appeals of rationality, spirituality, and idealism; the politicization of personal life; the impact of the Bolshevik Revolution and its aftermath. HU

HIST 238a, Britain's Empire to 1776 Steven Pincus

Exploration of why Britain was able to transform itself during the seventeenth and eighteenth centuries from a minor offshore archipelago into the world's greatest power. Focus on changes both within Britain and in North America, the West Indies, and South Asia. The British Empire situated in relation to other empires; the virtually simultaneous creation of a British Empire in India and loss of an empire in North America; the American Revolution as part of a British imperial crisis. HU
History: Preindustrial

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 250b, Gender and Sexuality in Modern Europe** Carolyn Dean

European concepts of gender and sexuality from the Enlightenment to the present. Changing constructions of ideas about womanhood and manhood; the relationship between gender and politics. HU

HIST 251a, Early Modern England: Politics, Religion, and Society under the Tudors and Stuarts Keith Wrightson

An introduction to the development of English society in the sixteenth and seventeenth centuries—a period of social, political, economic, and cultural transition, and one that provided the immediate context of early British settlement in North America and the literature of the English Renaissance. HU
History: Preindustrial

HIST 261a / PLSC 176a, The Cold War John Gaddis

The Cold War from beginning to end, viewed from the perspective of all its major participants, with emphasis on recently released Soviet, East European, and Chinese sources. Counts toward either European or U.S. distributional credit within the History major, upon application to the director of undergraduate studies. HU, SO

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, Eastern Europe since 1914 Timothy Snyder

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 271b, 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 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

History: Preindustrial

HIST 300b / CLCV 204b, Alexander the Great and the Hellenistic World Joseph Manning

The history and culture of the ancient world between the rise of Macedonian imperialism in the fourth century B.C.E. and the annexation of Egypt by Augustus in 30 B.C.E. Particular attention to Alexander, one of the most important figures in world history, and to the definition of "Hellenism." HU

History: Preindustrial

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

History: Preindustrial

HIST 323b, Southeast Asia since 1900 Benedict Kiernan

Comparative colonialism, nationalism, revolution, and independence in modern Southeast Asia. Topics include Indonesia and the Dutch, Indochina under French rule, the United States in the Philippines and Vietnam, Buddhism in Burma and Thailand, communist and peasant movements, and the Cambodian revolution and its regional repercussions. 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 335b / AFST 335b, 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

History: Preindustrial

HIST 341a / MMES 341a, Political Islam, Past and Present Julia Stephens

A historical introduction to Islamic law and debates in Islamic political thought from the Prophet to the Arab Spring. Different interpretations of Islamic law, the formation of Muslim empires, European colonialism, nationalist movements, jihad, and the role of religion in contemporary politics in the Middle East, South Asia, Southeast Asia, Europe, and the United States. HU

HIST 344b, Making of the Modern Middle East Rosie Bsheer

Introduction to narratives and debates in the history of the Middle East from the mid-eighteenth century to the present. Local, regional, and global events and processes; political, social, cultural, and intellectual realities. Readings from the fields of history, anthropology, politics, and literature. HU

HIST 350a / MMES 175a / NELC 350a, Formation of the Islamic State, 610 –750 Adel Allouche

The development of Islamic polity and society from the rise of Islam to the rise of the Abbasid dynasty. Religious and societal changes caused by the success of Muhammad's mission; ramifications of the subsequent Arab expansion at the expense of the Byzantine and Sasanian empires. The origins of Islamic institutions; the historical development of the main religious sects and of Islamic legal thought; Western views of Islam. HU

History: Preindustrial

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

History: Preindustrial

HIST 366a, History of Cities in Modern Asia Peter Perdue and Mark Baker

The history of Asian cities, with emphasis on long-term processes of urbanization and the daily life of hundreds of millions of people. Focus on China, now home to six of the world's thirty largest cities. Includes discussion of Japan, India, and related areas as well. HU

HIST 373b, The Silk Road Valerie Hansen

A journey along the overland and sea routes that connected China, India, and Iran from 200 to 1000 C.E. and served as conduits for cultural exchange. The lives of merchants, envoys, pilgrims, and travelers interacting in cosmopolitan communities. Exploration of long-known and newly discovered archaeological ruins, along with primary sources in translation. HU

HIST 375b / EAST 375b, 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 396b / SAST 224b, India and Pakistan since 1947 Rohit De

Introduction to the history of the Indian subcontinent from 1947 to the present. Focus on the emergence of modern forms of life and thought, the impact of the partition on state and society, and the challenges of democracy and development. Transformations of society, economy, and culture; state building; economic policy. HU

HIST 464a / CLCV 234a, Egypt and the Classical World in the First Millennium B.C.
Joseph Manning

The history of Egypt from the end of the pharaonic period through encounters with the Greek, Persian, and Roman worlds. The unusual position of Egypt in the long history of the Mediterranean; the transformation of Egyptian society during the first millennium B.C., a time of momentous change across western Asia and the Mediterranean world. 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 103Jb / AFAM 202b, Life and Writings of Frederick Douglass** David Blight
The life, times, and works of Frederick Douglass, African American abolitionist and leader of the nineteenth century. Douglass's writings, including autobiographies, oratory, and editorials, and his role as a historical actor in the antislavery and early civil rights movements. Deep inquiry into the craft of biography. WR, HU

* **HIST 108Jb, Pirates, Buccaneers, and Corsairs in America** Alejandra Dubcovsky-Joseph
The rise and fall of Caribbean piracy from its origins in the sixteenth century to the "golden age" that flourished in the early eighteenth century. Topics include the life and motivations of pirates, pirates' relations to monarchical and state authorities, and the role of violence in shaping the Atlantic world. WR, HU

* **HIST 113Jb / AMST 457b, Cultural Capital: New York in the Twentieth Century**
Jean-Christophe Agnew
An interdisciplinary study of New York City as a global cultural capital in the twentieth century. Social, political, and economic forces shaping the principal institutions of the city's patrician, popular, and mass cultures. The formation of identifiably "New

York" styles in the arts, architecture, photography, literature, and film. The changing geography of cultural creation, reproduction, and distribution in the city. WR, HU

* **HIST 130Jb / AMST 441b / ER&M 370b, 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

History: Preindustrial

* **HIST 133Ja, The Creation of the American Politician, 1789–1820** Joanne Freeman

The creation of an American style of politics: ideas, political practices, and self-perceptions of America's first national politicians. Topics include national identity, the birth of national political parties, methods of political combat, early American journalism, changing conceptions of leadership and citizenship, and the evolving political culture of the early republic. WR, HU

History: Preindustrial

* **HIST 134Ja, 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 RP

* **HIST 135Jb, 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

History: Preindustrial

* **HIST 136Ja, Liberalism and Conservatism in the Modern United States** Beverly

Gage

American domestic politics and political thought since the New Deal. Emphasis on the decline of midcentury liberalism and the rise of modern American conservatism. Topics include McCarthyism, the civil rights movement, the New Left, labor, business activism, the conservative intellectual movement, the Christian Right, and the Reagan Revolution. WR, HU

* **HIST 138Ja, Problems in American Historical Memory: The Civil War** David Blight

The problem and the study of "memory" among American and international historians and scholars from other disciplines. Readings drawn from theoretical works, recent secondary literature, and public history controversies. WR, HU

* **HIST 139Ja / AFAM 255a, The American South, 1870 to the Present** Glenda

Gilmore

A thematic approach to the history of the American South since Reconstruction. Focus on the political, social, and cultural history of a region that has undergone dramatic change. Topics include white supremacy and African American resistance,

industrialization and labor activism, music and literature, the civil rights movement and the rise of the Republican South, and changing regional identity. WR, HU

* **HIST 141Ja / HSHM 411a, Science from Newton to Neutrons** William Summers
Major themes and ideas in science from the seventeenth century through the twentieth. Focus on evolving descriptions and theories of matter and energy, physics, and chemistry. The evolution of Newtonian ideas to the world of modern physics and the transition from alchemical thinking to the chemical revolution. WR, HU

* **HIST 142Ja / HSHM 445a / WGSS 453a, Women and Medicine in America from the Colonial Era to the Present** Naomi Rogers

American women from the colonial era to the present as midwives, patients, healers, reformers, revolutionaries, innovators, and entrepreneurs. Ways that women have shaped American health care and medical research. WR, HU

* **HIST 148Jb / AFAM 210b / AMST 445b, Politics and Culture of the U.S. Color Line**
Matthew Jacobson

The significance of race in U.S. political culture, from the "separate but equal" doctrine of *Plessy v. Ferguson* to the election of an African American president. Race as a central organizer of American political and social life. HU RP

* **HIST 151Ja / AMST 422a / ER&M 435a, 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 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 170Jb, Ideas and Ideologies in U.S. International History** Patrick Cohrs

The influence of American and foreign ideas and ideologies on U.S. international history. American assumptions about peace and international order from the days of the early republic and the Federalist Papers to the height of the Cold War. Emphasis on American responses to war and international crises, and on the impact of exceptionalist, imperialist, isolationist, "exemplarist," and capitalist ideologies on U.S. policy making. WR, HU

* **HIST 181Jb, World War II and Its Legacies** Jenifer Van Vleck

The political, cultural, and economic dimensions of the Second World War and its effects on the postwar international order. Topics include the United States' ascendancy as a global superpower; the onset of the Cold War; anticolonialism and the decline of the European empires; new communication technologies and mass culture; the formation of the United Nations; and the politics of human rights. 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 215Jb, The Art of Biography** John Gaddis

A comparative examination of successful as well as unsuccessful biographies, intended to identify both principles and pitfalls. WR, HU

* **HIST 216Jb, Eurasian Encounters before 1500** Anders Winroth

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

History: Preindustrial

* **HIST 219Jb / JDST 274b, Jews of Eastern Europe, 1500–1900** Moshe Rosman

The social, economic, cultural, and political history of the Jews in historical Poland and Russia during the early modern and modern periods. Topics include law, learning, money, community, hasidism, shtetl, and war. HU

History: Preindustrial

* **HIST 228Ja, Venice and the Mediterranean, 1400–1700** Francesca Trivellato

Major issues in the history of Venice and the Mediterranean in the early modern period as they emerge from the works of historians and from a reading of primary sources in English translation. Topics include travel narratives, the organization of trade, slavery, Venetian republicanism, women and gender roles, the Inquisition, ethnic and religious minorities, and relations between East and West. WR, HU

History: Preindustrial

* **HIST 233Jb, The Emergence of Modern Paris** John Merriman

The economic, social, political, architectural, and cultural transformation of Paris from the Old Regime to the contemporary era. Topics include revolutionary Paris, the impact of rapid migration, the changing social geography of Paris in the time of Balzac and Zola, the rebuilding of Paris in the Second Empire, Paris and the impressionists, the emergence of the "red belt," and the successes and failures of twentieth-century planning. Reading knowledge of French helpful but not required. WR, HU

* **HIST 235Jb, Existentialism and Dissent** Marci Shore

Intellectual history of twentieth-century Europe, focusing on existentialist philosophy and its confrontation with Marxism in theory and with communist regimes in practice.

WR, HU

* **HIST 242Jb / CLCV 319b / MGRK 300b / WGSS 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

* **HIST 253Ja / LAST 253a, Culture, Dissidence, and Control in Golden Age Spain**

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

History: Preindustrial

* **HIST 259Ja, Cosmopolitanism and the Nation State in Modern Europe** Isaac

Nakhimovsky

Cosmopolitanism, patriotism, and nationalism in modern European intellectual history. Focus on eighteenth-century development of theories of the nation state. Readings from Montesquieu, Rousseau, Kant, Sieyes, Herder, Fichte, Mazzini, J. S. Mill, Meinecke, Bauer, and Arendt, as well as contributions to contemporary historiography and political theory. WR, HU

* **HIST 261Jb / RLST 204b, Enlightenment and Religion** David Sorkin

The relationship between the Enlightenment and religion, with a focus on Western and Central Europe across confessional boundaries (Protestantism, Catholicism, Judaism). How Enlightenment thinkers viewed religion; uses made of the Enlightenment by theologians and clergy. WR, HU

* **HIST 270Ja, Philosophy of History in Central Europe** Marci Shore

Ways in which central European philosophers before, during, and after the communist period grappled with the meaning of history, the role of the individual within history, and the space for ethics within historical determinism. Philosophy of history as an aspect of, and response to, the totalitarian experiments of the twentieth century. WR, HU

* **HIST 272Ja, Russia in the Age of Revolution, 1890–1924** Sarah Brinegar

The end of the Russian empire and the creation of the Soviet Union, including World War I, the Russian Civil War, and three major revolutions. Processes and forces that led to massive political and social changes between 1905 and 1924; connections among radical ideas, social movements, war, and political change. WR, HU

* **HIST 274Jb, Stalin and the Soviet Union, 1920–1939** Sarah Brinegar

The Soviet Union under Joseph Stalin, including the violent collectivization of agriculture, rapid industrialization, the Great Terror, and the introduction of mass education and literacy. The creation of the Stalinist state and the so-called revolution from above; how people lived and understood the Soviet experience; achievements sought by the Soviet experiment; the relationship between Leninism and Stalinism.

WR, HU

* **HIST 277Ja, 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; memory of the French Revolution; memory and rise of nationalism; memory in and of World Wars I and II; the relationship between memory of the Holocaust and the process of decolonization.

WR, HU

- * **HIST 288Ja / CLCV 408a, Athenian Imperial Democracy** Donald Kagan
A history of Greece in the years between the Persian invasion and the Peloponnesian War, with emphasis on Athens. HU
- * **HIST 299Jb / HUMS 192b, 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 306Jb / EAST 464b, Japan and the Ocean, 1600 to the Present** Staff
An ocean-centered history of Japan since c. 1600. Practices in the use of land and sea; how such practices have changed with political unification, political revolution, and the rise and fall of an empire. Topics include piracy, fisheries diplomacy, sushi, pollution, and nuclear power. WR, HU
- * **HIST 308Ja, History and Politics in Early China** Annping Chin
How the history and politics of early China came to shape political thinking and policy debates in two thousand years of imperial rule. WR, HU
- * **HIST 309Ja / EAST 309a, 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 342Ja, The Middle East and the West: A Cultural Encounter** Abbas Amanat
Cultural dialogues and confrontation between the modern Middle East and the West (Europe and North America) and their significance for our time. Western images of the Orient and discourse of Orientalism, Middle East as a modern construct, Muslim knowledge of Western modernity, impact of colonialism and territorial conflicts, and cultural roots of Islamic Jihadism and nonstate terrorist entities. WR, HU
- * **HIST 358Jb / ER&M 270b / LAST 356b, History of Mexico since Independence**
Gilbert Joseph
Modern Mexico from the wars of independence in the early nineteenth century to the present. Social, cultural, and economic trends and their relationship to political movements; particular emphasis on the Revolution of 1910 and the long shadow it has cast, and on patterns of relations with the United States. 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 379Ja / HSHM 447a, History of Chinese Science** William Summers
Major themes in Chinese scientific thinking from antiquity to the twentieth century. Non-Western concepts of nature and the development of science in China; East-West scientific exchanges; and China's role in modern science. WR, HU RP

* **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
History: Preindustrial

* **HIST 384Jb / MMES 172b / NELC 403b, The Middle East between Crusaders and Mongols** Adel Allouche
The impact of the Crusades and the Mongol conquests on the Islamic Middle East. Political, social, and economic changes in the region from the eleventh century to the middle of the fourteenth. Emphasis on the rise of new dynasties as a result of changes in the ethnic mosaic of the Middle East. WR, HU
History: Preindustrial

* **HIST 385Ja, Reformers and Revolutionaries in the Arab World** Rosie Bsheer
Major social and intellectual trends of the Arab world and their relation to major events and movements of the twentieth century. The influence of colonial, postcolonial, and neocolonial thought; issues faced by activists, lawyers, feminists, leftists, nationalists, Islamists, secularists, liberals, and unionists; ways in which such struggles shaped people's social lives and futures; the causes and implications of current uprisings. WR, HU

* **HIST 387Ja / AFST 487a, West African Islam: Jihad Tradition and Its Pacifist Opponents** Lamin Sanneh
The influence of Islam on state and society, and the encounters of Muslim Africans first with non-Muslim societies in Africa and then with the modern West in the colonial and postcolonial periods. Focus on Muslim religious attitudes and responses to the secular national state and to the Western tradition of the separation of church and state. WR, HU

* **HIST 388Ja / AFST 486a, Slavery and the Slave Trade in Africa** Robert Harms
The slave trade from the African perspective. Analysis of why slavery developed in Africa and how it operated. The long-term social, political, and economic effects of the Atlantic slave trade. WR, HU
History: Preindustrial

* **HIST 398Jb / MMES 173b / NELC 404b, Mamluk Egypt** Adel Allouche
A study of the Mamluks, manumitted slaves initially imported to Egypt for military service who established their own rule over Egypt and Syria (1250–1517). Focus on the structure and workings of the Mamluk state. Military, political, economic, and social factors that contributed to the grandeur and, later, the decline of the Mamluk period in Egypt and its conquest by the Ottoman Turks. WR, HU
History: Preindustrial

* **HIST 405Ja, Emergence of the Nation-State** Ariel Ron
The origins and sustaining conditions of nation-states and the emergence of national consciousness. Political, social, cultural, and economic structures that came to define and underpin nation-states in the nineteenth century. Case studies examine specific countries, nationalist thinkers, and religious contexts, including an extended case study of the early United States. Readings from both theoretical works and historical monographs. WR, HU

* **HIST 413Jb / HSHM 420b / PSYC 436b, History of Addiction** Henry Cowles

A survey of the understanding and treatment of addiction in the modern period. Psychology and psychiatry; alcoholism, abstinence, and prohibition; gambling and other behavioral addictions; recent work on habit formation; and addiction narratives in literature and film. Readings include primary texts from a range of scientific and medical fields as well as from court cases, political debates, and social and religious movements. WR, HU

* **HIST 420Ja / HSHM 469a, Photography and the Sciences** Chitra Ramalingam

The making of photography's discursive identity as an experimental and evidentiary medium in the sciences, from its announcement to the public in 1839 to the digital innovations of the present. Historical and archival perspectives on uses for photography in different fields of the natural and human sciences. Use of photographic image collections in the Peabody Museum and the Beinecke Library. WR, HU

* **HIST 429Jb / HSHM 412b, The History of the Laboratory** Chitra Ramalingam

The social and cultural history of the experimental laboratory as a site for scientific activity, from early modern origins to the present day. The early modern origins of the laboratory; private, institutional, and state laboratories; relations between labs and field stations; the lab in the colonial and developing world; industrial and corporate labs; laboratory architecture; secrecy and openness; gender in the experimental workplace; and popular representations of the laboratory. Undergraduate enrollment limited to juniors and seniors. WR, HU

* **HIST 431Jb, Family and Empire** Julia Stephens

The role of families in the production and reproduction of political and economic power from the imperial harems of early modern empires to dynastic families in contemporary politics. Focus on Asia and the British Empire. Histories of dynastic, colonial, mixed-race, diasporic, and merchant families. Sources include biographies, obituaries, letters, legal documents, and novels. WR, HU

* **HIST 435Jb / HSHM 437b, The Global Crisis of Malaria** Frank Snowden

The global crisis of malaria examined in comparative and historical context. The mosquito theory of transmission and other developments in scientific understanding of the disease; World Health Organization strategies to eradicate malaria since 1955; the development of tools such as insecticides, medication, and bed nets; the attempt to create an effective vaccine. WR, HU

* **HIST 449Ja, The United States and the International System, 1776–1920** Patrick Cohrs

The transformation of the modern international system and of America's role in this system from the American Revolution to the Paris peace conference. Underlying causes of international conflicts; the Vienna and Versailles peace settlements; the Monroe Doctrine; international relations in the era of imperialism; the emergence of the United States as a world power; Woodrow Wilson's pursuit of a "peace to end all wars." WR, HU

* **HIST 464Ja, Law and History** Rohit De

The role of law and legal institutions in shaping everyday life. Ways in which societies throughout history have engaged with law, rules, and legal institutions, from the Roman Empire to Ottoman Egypt to the U.S. civil rights era. Methodologies and sources in the study of legal history. WR, 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 481Ja, Grand Narratives in Global History** Fabian Drixler
Analysis of recent attempts to find patterns and unifying narratives in the complexity of world history. Topics include the decline of violence, economic divergences and global inequality, geographic determinism, climate and history, human history and the biosphere, demographic and evolutionary perspectives on history, history as neurochemistry, and the shifting shape of world history from different geographical vantage points. 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** Glenda Gilmore

All senior History majors should attend the mandatory senior essay meeting on Monday, September 14, 2015, at 3 p.m. in a location to be announced. The senior essay is a required 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. The 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 expecting to graduate in May enroll in HIST 495a during the fall term and complete their essays in HIST 496b in the spring term. December graduates enroll in HIST 495b in the spring term and complete their essays in HIST 496a during the following fall term; students planning to begin their essay in the spring term should notify the senior essay director by December 4, 2015. 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 undergraduate History administrator in 237 HGS no later than September 21, 2015 (for HIST 495a) or January 18, 2016 (for 495b). Blank statement forms are available in 237 HGS 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 and a draft bibliographic essay by the announced deadlines, and at least ten pages of the essay by December 1, 2015 (495a), or May 2, 2016 (495b). Those who meet these requirements receive a temporary grade of SAT, 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 April 4, 2016, in the spring term, or no later than 5 p.m. on December 7, 2015, in the fall term. 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.

History of Art

Director of undergraduate studies: Carol Armstrong, 658 LORIA, 432-2680, carol.armstrong@yale.edu; arthistory.yale.edu

FACULTY OF THE DEPARTMENT OF HISTORY OF ART

Professors Carol Armstrong, Tim Barringer, Edward Cooke, Jr., Diana Kleiner, Kobena Mercer, Amy Meyers (*Adjunct*), Mary Miller, Robert Nelson, Jock Reynolds (*Adjunct*), Vincent Scully (*Emeritus*), Nicola Suthor, Robert Thompson (*Emeritus*), Mimi Yiengpruksawan

Associate Professors Milette Gaifman, Jacqueline Jung, Kishwar Rizvi

Assistant Professors Craig Buckley, J. D. Connor, Erica James, Youn-mi Kim, Jennifer Raab, Tamara Sears, Sebastian Zeidler

Lecturers Ruth Barnes, Theresa Fairbanks-Harris, Lisa Ford, Karen Foster, John Stuart Gordon, Ian McClure, David Sensabaugh, Samuel Shaw, Anne Underhill

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.

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.

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, may place out of one 100-level course.

Intermediate and advanced courses, numbered above 200, encompass more specialized surveys and themes in art history. The major requires six courses numbered above

200, of which two must be seminars numbered above 400; the six courses 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. The 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.

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.

Electives may include courses from other departments if they have direct relevance to the major program of study. Approval of the director of undergraduate studies 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.

Senior essay 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 director of undergraduate studies. It is also possible to write a two-term senior essay, with permission of the director of undergraduate studies. Students wishing to write a two-term essay must submit a petition to the director of undergraduate studies and the prospective adviser, normally by the first week after spring break of the junior year.

Credit/D/Fail courses Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

Procedures The schedules of all majors must be approved and signed by the director of undergraduate studies. Students may consult the following members of the faculty about the major:

BK	K. Rizvi	MC	to be announced
BR	M. Gaifman	PC	D. Kleiner
CC	to be announced	SY	M. Miller
DC	E. Cooke	SM	S. Zeidler
TD	to be announced	ES	M. Yiengpruksawan
JE	T. Sears	TC	T. Barringer

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 Street.

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)

Courses

* **HSAR 009a / AFAM 008a / AFST 008a, Aesthetics and Meaning in African Arts and Cultures** Erica James

The diversity of artistic production on the African continent, both historically and materially. The creative consciousness and aesthetic values of a variety of African cultures from ancient to contemporary times. Questions that arise when writing these histories without fully taking into account concepts of "African time." HU

HSAR 112a, Introduction to the History of Art: Prehistory to the Renaissance

Jacqueline Jung

Form as meaning in architecture, sculpture, and painting. Selected studies in these arts from prehistory to the Renaissance. Source readings in translation. 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 142a / RLST 187a / SAST 265a, Introduction to the History of Art: The

Classical Buddhist World Youn-mi Kim

Buddhist art and architecture of India, Pakistan, Afghanistan, and central Asia from earliest beginnings to the tenth century, and including Greco-Roman, Persian, and Islamic contact. HU

HSAR 238a / ARCG 238a / NELC 107a, Buried Cities: Thera, Pompeii, and

Herculaneum Karen Foster

Study of three ancient cities buried by volcanic eruptions—Thera in c. 1530 B.C. and Pompeii and Herculaneum in A.D. 79—with emphasis on their architecture, wall paintings, and small finds in cultural and historical context. HU

HSAR 247b / ARCG 161b / CLCV 161b, Art and Myth in Greek Antiquity Milette

Gaifman

Visual exploration of Greek mythology through the study of ancient Greek art and architecture. Greek gods, heroes, and mythological scenes foundational to Western culture; the complex nature of Greek mythology; how art and architecture rendered myths ever present in ancient Greek daily experience; ways in which visual representations can articulate stories. Use of collections in the Yale University Art Gallery. HU

* **HSAR 251a / FREN 366a, 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 252a / ARCG 252a / CLCV 175a, 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 265a, Art of Byzantium, 850–1200 Robert Nelson

A survey of the art of Byzantium, a multinational empire that considered itself the direct successor to ancient Rome. Mosaics, churches, icons, enamels, silks, and carved ivories are placed in the context of the empire, the theology of religious images, and the history of devotional practices. HU

HSAR 273b, Art of Gothic Cathedrals Jacqueline Jung

European Gothic churches (1140–1400) explored as multimedia architectural environments in which stained glass, sculpture, textiles, and liturgical furnishings are integral aspects of design and meaning. Buildings considered for their formal and material qualities and as sites of ritual performance and signs of political and social power. Recommended preparation: HSAR 112. HU

HSAR 281b, Visual Arts in the Age of Reason Nicola Suthor

Visual arts of the seventeenth and eighteenth centuries. Focus on how the arts were an essential component of the so-called Age of Reason, synonymous with the Age of Enlightenment. HU

HSAR 308a, Art and Music in Britain from *The Beggar's Opera* to Punk Rock Tim Barringer

The relationship between art and music in British culture from the courts of the seventeenth century to the present day. Focus on collaborations between musicians and artists and on the juxtaposition of elite and popular strands in British culture. Close examination of key works, from William Lawes's *Britannia Triumphans* and John Gay's *The Beggar's Opera* to the Sex Pistols' "God Save the Queen." HU

* **HSAR 310b / HUMS 270b, Futurism: The Shock of the New** Amerigo Fabbri
Cultural and intellectual shifts in literature, philosophy, and the arts at the end of the nineteenth century, marking the rise of modernism. Futurism, surrealism, and other avant-garde movements that transformed into art the dramatic challenges of a new technological and psychological reality. HU

HSAR 323a, Early Twentieth-Century Art Sebastian Zeidler

Modern art in Europe and America, c. 1880–1945. Topics include individual artists (Rodin, Brancusi), historical avant-gardes (Dadaism, surrealism), the transformation of traditional media such as painting and sculpture, and the invention of collage and photomontage. HU

*** HSAR 325b / ARCH 261b, History of Architecture II: The Eighteenth Century to the Millennium** Eeva-Liisa Pelkonen

Modern architecture and urbanism from the eighteenth century to the end of the twentieth. Genesis and meaning of architectural form, applying national, cultural, and international contexts. HU

HSAR 328a / FILM 285a, Disney J. D. Connor

History of the Walt Disney Company from origins to today. Early animation, popular modernism, mid-century television, development of the theme parks and nature films, the Disney princess, the animation renaissance, and the current portfolio of brands, such as Pixar, Marvel, and LucasFilm. WR, HU

HSAR 329b, Picasso and Matisse Sebastian Zeidler

An in-depth survey of two major modern painters: Picasso from the 1890s to *Guernica*, Matisse from neo-impressionism to the postwar years. Focus on historically informed visual analysis. HU

HSAR 346a, Twentieth-Century Photography Carol Armstrong

The history of photography during the twentieth century. Technological advances such as hand-held cameras with spooled film, the half-tone method of photographic reproduction, and digital images. Photography in mass print culture and in museums; the rise of cinema; divisions between amateur and professional photographers; the challenge to painting as the dominant image form. HU

HSAR 351b, Chinese Landscape Painting Youn-mi Kim

Historical overview of Chinese landscape painting from the fourth to the twentieth century, with an emphasis on stylistic development. Painting theory and aesthetics; social discourse related to landscape painting in premodern Chinese intellectual history; the Chinese response to Western art in modern times. Examination of paintings from the Yale University Art Gallery. HU

HSAR 357a or b, Art and Architecture of Japan Mimi Yiengpruksawan

Survey of Japanese art and architecture from earliest times through the early nineteenth century. Introduction to paradigmatic monuments, with a focus on programmatic multimedia ensembles as found at Buddhist temples, Shinto shrines, Zen monastic enclaves, military installations and castles, vernacular living spaces, and public institutions of governance. HU

HSAR 374a / AFAM 189a, Black Art and Material Culture in Early Modern America

Erica James

This course engages histories of black representation and artistic production by black people in the United States from the colonial period through the Harlem Renaissance. It offers a comprehensive overview and critique of black expressive forms across media, in relation to mainline discourses of American art and within the context of American economic, cultural, social, and political histories. 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 403a, Observation and Analysis** Theresa Fairbanks

A survey of the techniques and materials employed in Western painting, sculpture, and graphic arts from antiquity to the present. Modern examination techniques analyzed as tools for connoisseurship, dating, and authentication, including study of age, damage, and restoration as they change works of art. General concepts of preservation and conservation. HU RP

* **HSAR 426b, 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 438b, The Altarpiece in Northern Europe, 1250–1500** Jacqueline Jung

Medieval European altarpieces as dynamic multimedia installations with a twofold identity: ritual objects that rendered sacred teachings visible during mass, and works of art that prompted painters and carvers to create dazzling displays of visual splendor and technical bravura. HU

* **HSAR 446a, Portraiture: Revolution to Romanticism** Tim Barringer

Study of portrait production in England and France from roughly 1770 to 1830, when portraiture not only reflected but advanced major social and political changes. Artists include Vigée-Lebrun, Reynolds, David, Gainsborough, Ingres, and Géricault. Focus on the examination of objects from the Yale Center for British Art and the Yale University Art Gallery. HU

* **HSAR 453a, Textiles of Asia, 800–1800 C.E.** Ruth Barnes

Survey of the great textile traditions of China, India, and the Islamic world from the ninth through eighteenth centuries C.E. The roles of central and southeast Asia in the transmission of styles and techniques. The cultural meaning, mobility, and cross-cultural significance of textiles in Asia. Extensive use of the Yale University Art Gallery's textile collections. HU

* **HSAR 460a / ENGL 247a, Writing about Contemporary Figurative Art** Margaret Spillane

A workshop on journalistic strategies for looking at and writing about contemporary paintings of the human figure. Practitioners and theorists of figurative painting; controversies, partisans, and opponents. Includes field trips to museums and galleries in New York City. Admission by application only. Application details and forms are available at english.yale.edu/undergraduate/applications-and-deadlines. WR, HU

* **HSAR 466b, The Technical Examination of Art** Ian McClure

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 469b / FILM 403, Filmscapes: The Art of Artifice** J. D. Connor

An intensive survey of filmic design. Themes include the credit sequence, art deco and the "Paramount look," the historical film, the near future, the monumental landscape, the explicitly artificial world, and the virtualization of production design. HU

* **HSAR 471a / AFAM 346a, Black Atlantic Photography** Kobena Mercer

Introduction to the social and artistic history of photography in Black Atlantic contexts from the mid-nineteenth century to the present. Uses of the photographic image in shaping understandings of race relations and black identities. Codes and conventions by which photographs are evaluated in terms of truth, reflection, testimony, expressivity, and construction. HU

* **HSAR 475b, Chinese Painting in the Seventeenth Century** David Sensabaugh
Chinese painting from the masters of the late Ming period to the individualist and orthodox masters of the early Qing dynasty. Issues of art based on either art or nature. Attention to paintings from the period in the Yale University Art Gallery collection.

HU

* **HSAR 483a, Chinese Funerary Art** Youn-mi Kim

Examination of major Chinese tomb sites from the third century B.C.E. to the thirteenth century C.E., including the famous terracotta army of the First Emperor. Traces of religious rituals and of beliefs about the afterlife in funerary artworks; the relations among visual art, religious views, and social values. HU

* **HSAR 490b / FILM 320b, Close Analysis of Film** J. D. Connor

Ways in which traditional genres and alternative film forms establish or subvert convention and expectation and express thematic and ideological concerns. The balancing of narrative containment and excess, as well as action and image. Use of body and voice, space and music. Examples include films by Antonioni, Zhang, Ozu, and Hitchcock. Prerequisite: FILM 150. HU

* **HSAR 496b, Art of the Surrealist Avant-Garde** Sebastian Zeidler

The major figures of the French surrealist movement, c. 1924–25, including all visual media—painting, sculpture, photography, collage, frottage, the "exquisite corpse," and the "found object." Topics include surrealism and psychoanalysis; primitivism; eroticism and the construction of gender; and the art-theoretical schism between Breton and Bataille, the movement's preeminent thinkers. HU

* **HSAR 498a or b, Independent Tutorial** Staff

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** Carol Armstrong

Preparation of a research paper about thirty pages long under the direction of a qualified instructor. The essay is written in either the fall or the spring term of the senior year, though preferably in the fall 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 instructor or with the director of undergraduate studies. No student is permitted to enroll in HSAR 499 without submitting a project statement, with the formal title of the essay and a brief description of the subject to be treated. The statement must be signed by the student's adviser and presented to the director of undergraduate studies before the student's schedule can be approved. The student must submit a suitable project outline and bibliography to the adviser and

the director of undergraduate studies early in the term. The outline should indicate the focus and scope of the essay topic, as well as the proposed research methodology; the bibliography should be annotated. Students must also complete a library research colloquium for the senior essay. For essays submitted in the fall term, the deadline for the outline is September 18; for those in the spring term, January 29. Senior essays written in the fall term are due on December 11; those in the spring term on April 25. Two copies must be submitted to the director of undergraduate studies. Failure to comply with any deadline will be penalized by a lower final grade. No late essay will be considered for a prize in the department. Permission may be given to write a two-term essay after consultation with an adviser and the director of undergraduate studies. 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 from fifty to sixty pages in length.

History of Science, Medicine, and Public Health

Director of undergraduate studies: William Rankin, HGS 206, 432-1354,
william.rankin@yale.edu; hshm.yale.edu

FACULTY ASSOCIATED WITH THE PROGRAM OF HISTORY OF SCIENCE, MEDICINE, AND PUBLIC HEALTH

Professors Naomi Rogers, William Summers, John Warner

Associate Professor Paola Bertucci

Assistant Professors Henry Cowles, Joanna Radin, William Rankin

Senior Lecturer Rebecca Tannenbaum

Affiliated Faculty Toby Appel (*Yale University Library*), Dimitri Gutas (*Near Eastern Languages & Civilizations*), Jennifer Klein (*History*), Joanne Meyerowitz (*History*), Amy Meyers (*Yale Center for British Art*), Alan Mikhail (*History*), Kevin Repp (*Yale University Library*), Paul Sabin (*History*), Gordon Shepherd (*School of Medicine*), Frank Snowden (*History*), Jenifer Van Vleck (*History*)

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 program explores questions such as whether science is universal, or whether each culture has its own approach to trustworthy knowledge; the relationship between medical expertise, social structure, and everyday life; the nature of technology and its relationship to political, economic, and military power; reasons why 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, 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.

The five standard pathways in the major are medicine and public health; global health; science, technology, and power; gender and sexuality; and arts and media. Students may also design customized pathways in consultation with the director of undergraduate studies. 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.

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.

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 seminar in History of Science, Medicine, and Public Health during the final term of the senior year. Distinction in the Major is awarded only to students who complete a yearlong senior project.

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's Web site (<http://hshm.yale.edu>).

Credit/D/Fail courses Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

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, 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 sem

Courses

* **HSHM 007a / HUMS 076a, Epidemics in Global Perspective** William Summers
Interaction of epidemic diseases and society. The response of government, medicine, and the public to the threat or actual presence of widespread contagious diseases. The notion of major epidemics as one of the key contingencies of history, critically examined through contemporary medical, political, and literary accounts. The changing responses of societies and governments to epidemics as well as the reasons for those responses. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU, SO

HSHM 204b / AMST 163b / EVST 120b / HIST 120b, American Environmental History Paul Sabin

Ways in which people have shaped and been shaped by the changing environments of North America from precolonial times to the present. Migration of species and trade in commodities; the impact of technology, agriculture, and industry; the development of resources in the American West and overseas; the rise of modern conservation and environmental movements; the role of planning and impact of public policies. WR, HU

HSHM 211b / EVST 211b / G&G 211b / HIST 143b, Catastrophe and the Earth Sciences since 1850 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 212b / HIST 146b / HLTH 280b, Historical Perspectives on Global Health
Joanna Radin

The broader historical context of contemporary practices, policies, and values associated with the concept of global health. Historical formations around ideas about disease, colonialism, race, gender, science, diplomacy, security, economy, and humanitarianism; ways in which these formations have shaped and been shaped by attempts to negotiate problems of health and well-being that transcend geopolitical borders. HU

HSHM 216a / CGSC 135a / HIST 118a / PSYC 135a, Minds and Brains in America
Henry Cowles

A survey of the science and medicine of mind and brain in America since 1800. Madness and the asylum; phrenology and psychoanalysis; psychology in politics, law, and advertising; the rise of the "neuro-" disciplines; mental health in public life. Texts from fields such as neurology, physiology, psychology, psychiatry, and philosophy. May not be taken after HSHM 409. WR, HU

* **HSHM 411a / HIST 141Ja, Science from Newton to Neutrons** William Summers
Major themes and ideas in science from the seventeenth century through the twentieth. Focus on evolving descriptions and theories of matter and energy, physics, and chemistry. The evolution of Newtonian ideas to the world of modern physics and the transition from alchemical thinking to the chemical revolution. WR, HU

* **HSHM 412b / HIST 429Jb, The History of the Laboratory** Chitra Ramalingam
The social and cultural history of the experimental laboratory as a site for scientific activity, from early modern origins to the present day. The early modern origins of the laboratory; private, institutional, and state laboratories; relations between labs and field stations; the lab in the colonial and developing world; industrial and corporate labs; laboratory architecture; secrecy and openness; gender in the experimental workplace; and popular representations of the laboratory. Undergraduate enrollment limited to juniors and seniors. WR, HU

* **HSHM 420b / HIST 413Jb / PSYC 436b, History of Addiction** Henry Cowles
A survey of the understanding and treatment of addiction in the modern period. Psychology and psychiatry; alcoholism, abstinence, and prohibition; gambling and other behavioral addictions; recent work on habit formation; and addiction narratives in literature and film. Readings include primary texts from a range of scientific and medical fields as well as from court cases, political debates, and social and religious movements. 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 432b / ER&M 360b / HLTH 370b / SOCY 390b / WGSS 390b, Politics of Reproduction** Rene Almeling
Reproduction as a process that is simultaneously biological and social, involving male and female bodies, family formation, and powerful social institutions such as medicine, law, and the marketplace. Sociological research on reproductive topics such as pregnancy, birth, abortion, contraception, infertility, reproductive technology, and aging. Core sociological concepts used to examine how the politics of reproduction are shaped by the intersecting inequalities of gender, race, class, and sexuality. WR, SO

* **HSHM 437b / HIST 435Jb, The Global Crisis of Malaria** Frank Snowden
The global crisis of malaria examined in comparative and historical context. The mosquito theory of transmission and other developments in scientific understanding of the disease; World Health Organization strategies to eradicate malaria since 1955; the development of tools such as insecticides, medication, and bed nets; the attempt to create an effective vaccine. WR, HU

* **HSHM 445a / HIST 142Ja / WGSS 453a, Women and Medicine in America from the Colonial Era to the Present** Naomi Rogers
American women from the colonial era to the present as midwives, patients, healers, reformers, revolutionaries, innovators, and entrepreneurs. Ways that women have shaped American health care and medical research. WR, HU

* **HSHM 447a / HIST 379Ja, History of Chinese Science** William Summers
Major themes in Chinese scientific thinking from antiquity to the twentieth century. Non-Western concepts of nature and the development of science in China; East-West scientific exchanges; and China's role in modern science. WR, HU RP

* **HSHM 455a / WGSS 460a, History of the Body: Science, Medicine, and the Arts**
Staff

The body as a site of knowledge in science, medicine, and the arts from antiquity to the present. The history of anatomy from Leonardo to the Body Worlds exhibits; the artificial body from the cyborg to cosmetic surgery; the gendering of natural knowledge. WR, HU

* **HSHM 469a / HIST 420Ja, Photography and the Sciences** Chitra Ramalingam
The making of photography's discursive identity as an experimental and evidentiary medium in the sciences, from its announcement to the public in 1839 to the digital innovations of the present. Historical and archival perspectives on uses for photography in different fields of the natural and human sciences. Use of photographic image collections in the Peabody Museum and the Beinecke Library. WR, HU

* **HSHM 470a or b and 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 490a or b and HSHM 491a or b, Yearlong Senior Project** Staff
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 4, 2016, in the spring term, or no later than 5 p.m. on November 30, 2015, 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** Staff
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 essay 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 in 207 HGS no later than September 18, 2015 (HSHM 492a), or January 19, 2016 (HSHM 492b). Blank statement forms are available in 207 HGS and in the HSHM Senior Project Handbook. Students enrolled in HSHM 492 must submit a completed senior project to 211 HGS no later than 5 p.m. on December 14, 2015, in the fall term, or no later than 5 p.m. on May 2, 2016, 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

Program director: James Silk, L39 SLB, 432-1729, humanrights.program@yale.edu; humanrights.yale.edu

ADVISORY COMMITTEE FOR THE SPECIAL ACADEMIC PROGRAM IN HUMAN RIGHTS

Vanessa Agard-Jones (*Women's, Gender, & Sexuality Studies*), Seyla Benhabib (*Political Science, Philosophy*), Crystal Feimster (*African American Studies*), Moira Fradinger (*Comparative Literature*), Inderpal Grewal (*Women's, Gender, & Sexuality Studies*), Gilbert Joseph (*History*), Benedict Kiernan (*History*), Alice Miller (*Law School, Public Health*), Thomas Pogge (*Philosophy*), Thania Sanchez (*Political Science*), James Silk (*Law School*), David Simon (*Political Science*), Jay Winter (*History*), Elisabeth Wood (*Political Science*)

The Special Academic Program in Human Rights 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 the Special Academic Program in Human Rights 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, four electives, and a 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. A capstone project, informed by extracurricular experience, is developed in consultation with the program director.

Additional information is available at the Human Rights Web page (<http://humanrights.yale.edu>).

Humanities

Director of undergraduate studies: Norma Thompson, Whitney Humanities Center, 53 Wall St., 432-1313, norma.thompson@yale.edu; chair: Bryan Garsten, 53 Wall St., 432-0670, bryan.garsten@yale.edu; www.yale.edu/humanities

FACULTY ASSOCIATED WITH THE PROGRAM OF HUMANITIES

Professors Jeffrey Alexander (*Sociology*), Dudley Andrew (*Film & Media Studies, Comparative Literature*), Seyla Benhabib (*Political Science*), R. Howard Bloch (*French*), Harold Bloom (*Humanities*), Leslie Brisman (*English*), David Bromwich (*English*), Rüdiger Campe (*German*), Francesco Casetti (*Humanities*), Stephen Davis (*Religious Studies, History*), Wai Chee Dimock (*English*), Carlos Eire (*History, Religious Studies*), Benjamin Foster (*Near Eastern Languages & Civilizations*), Paul Freedman (*History*), Kirk Freudenburg (*Classics*), Bryan Garsten (*Political Science*), Phyllis Granoff (*Religious Studies*), Emily Greenwood (*Classics*), Frank Griffel (*Religious Studies*), Karsten Harries (*Philosophy*), Christine Hayes (*Religious Studies, Judaic Studies*), Carol Jacobs (*German*), Edward Kamens (*East Asian Languages & Literatures*), Alice Kaplan (*French*), Anthony Kronman (*School of Law*), Kathryn Lofton (*Religious Studies, American Studies, History*), Tina Lu (*East Asian Languages & Literatures*), John MacKay (*Slavic Languages & Literatures*), Stefanie Markovits (*English*), Brigitte Peucker (*German*), Steven Pincus (*History*), Leon Plantinga (*Emeritus*) (*Music*), Joseph Roach (*English, Theater Studies*), John Rogers (*English*), Andrew Sabl (*Ethics, Politics, & Economics*) (*Visiting*), Maurice Samuels (*French*), Steven Smith (*Political Science, Philosophy*), William Summers (*History of Medicine*), Henry Sussman (*German*) (*Visiting*), Gary Tomlinson (*Music, Humanities*), Francesca Trivellato (*History*), 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 Medicine*), Sarah Demers (*Physics*), Toni Dorfman (*Adjunct*) (*Theater Studies*), Martin Hägglund (*Comparative Literature, Humanities*), Karuna Mantena (*Political Science*), Andrew March (*Political Science*), Paul North (*German*), Marci Shore (*History*), Kirk Wetters (*German*)

Assistant Professors Rebekah Ahrendt (*Music*), Marijeta Bozovic (*Slavic Languages & Literatures*), Molly Brunson (*Slavic Languages & Literatures*), Thomas C. Connolly (*French*), Henry Cowles (*History of Medicine, History*), Emily Erikson (*Sociology*), Bella Grigoryan (*Slavic Languages & Literatures*), Christiana Purdy Moudarres (*Italian*), Isaac Nakhimovsky (*History*), Dixia Ramirez (*American Studies*)

Senior Lecturers Peter Cole (*Judaic Studies*), Ronald Gregg (*Film & Media Studies*), Charles Hill (*Humanities*), Stuart Semmel (*History, Humanities*), Kathryn Slanski (*Humanities, Near Eastern Languages & Civilizations*), Norma Thompson (*Humanities*), Christian Wiman (*Institute of Sacred Music, Divinity School*)

Lecturers Jeffrey Brenzel (*Yale College*), Karla Britton (*Divinity School*), Emily Coates (*Theater Studies*), Matthew Croasmun (*Religious Studies*), Amerigo Fabbri (*Humanities*), Hilary Fink (*Slavic Languages & Literatures*), Karen Foster (*Near Eastern Languages & Civilizations*), Mia Reinoso Genoni (*History of Art*), Virginia Jewiss

(*Humanities*), Camille Lizarribar (*Humanities*), Judith Malafrente (*Music*), Thomas Miller (*Humanities*), Terence Renaud (*Humanities*), Karin Roffman (*Humanities, English*), Pamela Schirmeister (*English*), George Syrimis (*Hellenic Studies*)

The undergraduate program in Humanities guides students in integrating 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. 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.

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 in the Class of 2018 and subsequent classes take two specially-commissioned core seminars, each co-taught by two faculty members from different but 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.

Requirements of the major for the Class of 2017 and previous classes Students in the Class of 2017 and previous classes may fulfill the requirements of the Humanities major that were in place when they entered the major, as described in previous editions of this bulletin (<http://www.yale.edu/printer/bulletin/archivepdf/files/YCPS>).

Requirements of the major for the Class of 2018 and subsequent classes 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 (with approval of the director of undergraduate studies), and a one- or two-term senior essay. Majors in Humanities are strongly encouraged to enroll in at least one term course in literature in a foreign language. Students are expected to declare their intent to major in Humanities in a meeting with the director of undergraduate studies before their junior year.

Foundations Three broad surveys of foundational works in any cultural tradition are required, such as HIST 280, The Catholic Intellectual Tradition, EALL 200, The Chinese Tradition, or RLST 189, Introduction to Indian Philosophy. One or two foundations courses must be in the classical tradition of Western Europe, such as Directed Studies, or ENGL 129, Tragedy in the European Literary Tradition, or CLCV 256, Ancient Athenian Civilization.

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 director of undergraduate studies.

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 director of undergraduate studies 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 Web site (<http://www.yale.edu/humanities/summer.html>) and the Yale Summer Session Web site (<http://summer.yale.edu>).

REQUIREMENTS OF THE MAJOR

Prerequisites None

Number of courses 14 term courses (incl senior essay)

Distribution of courses 3 foundations courses; 2 core sems; 1 course in each of 4 disciplinary areas; 4 electives in concentration

Senior requirement Senior essay (HUMS 491)

Seminars for Freshmen

* **HUMS 076a / HSHM 007a, Epidemics in Global Perspective** William Summers
Interaction of epidemic diseases and society. The response of government, medicine, and the public to the threat or actual presence of widespread contagious diseases. The notion of major epidemics as one of the key contingencies of history, critically examined through contemporary medical, political, and literary accounts. The changing responses of societies and governments to epidemics as well as the reasons for those responses. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU, SO

* **HUMS 078a, Shakespeare and Music** Judith Malafronte
The use of music in Shakespeare's plays, from the original stagings and seventeenth-century adaptations to modern productions. Consideration of operatic versions of the plays from the nineteenth, twentieth, and twenty-first centuries. Includes a field trip to New York City. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. HU

Core Seminars

* **HUMS 400a / FREN 399a / PLSC 316a, Modernities** R. Howard Bloch and Steven Smith

An interdisciplinary study of philosophy, social thought, and some key literary works connected to two moments of modernity—the Enlightenment and the period of the "great upheaval" (1870–1915). HU, SO

* **HUMS 401b / EALL 318b, Interpretations: The Dream of the Red Chamber** Tina Lu and R. Howard Bloch

Close reading of the eighteenth-century Chinese novel *The Dream of the Red Chamber* in translation, with some attention to secondary and theoretical materials. The novel is used to examine humanistic questions, including what it means to read across cultures. Priority to Humanities majors. HU

Humanities Electives

* **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 and their influence on Western representation since the seventeenth century. Secondary readings included. 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 Tennyson and Whitman to the Present** Harold Bloom

The complexities of poetic influence in the tradition of the English language, from Tennyson and Whitman to the present. HU

* **HUMS 184a, Experiments in Twentieth-Century Literary Biography** Karin Roffman

The history and practice of literary biography explored through groundbreaking experiments in form and theory. Ethics and responsibilities in the shifting relationship between biographer and subject. Complexities in research and writing, including multiple perspectives on the same event, contradictory archival evidence, and conflicting narrative truth. Focus on modern biographies and recent novels that examine the process of writing a life. HU

* **HUMS 192b / HIST 299Jb, 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 193b, Screening the Past** Stuart Semmel

An interdisciplinary study of cinematic representations of the historical past. Films that treat historical events realistically; others that deliberately present history as it did not happen. Standards that can be applied to judge history on the screen; lessons for evaluating history on the page. HU

* **HUMS 205a, Boundaries of the Body in Law and Literature** Camille Lizarríbar

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 231b / MUSI 435b, Music in European Thought: Three Moments in the Modern Era** Leon Plantinga

An inquiry into the role of music and thought about music at three critical junctures in the intellectual and cultural history of modern Europe: the birth of modernity and opera; the Enlightenment and the classical style; and German romanticism and Beethoven. HU

* **HUMS 270b / HSAR 310b, Futurism: The Shock of the New** Amerigo Fabbri

Cultural and intellectual shifts in literature, philosophy, and the arts at the end of the nineteenth century, marking the rise of modernism. Futurism, surrealism, and other avant-garde movements that transformed into art the dramatic challenges of a new technological and psychological reality. HU

* **HUMS 300b, Oratory in Statecraft** Charles Hill

A seminar and practicum in oratory, the first tool of leadership. A study of oratory as it provides direction, builds support, and drives action on a strategic agenda. Analysis of speeches in antiquity, the early modern era, and the unique American voice: Edwards to Lincoln to King. HU

* **HUMS 310a, Aristotelian Statecraft** Charles Hill

Connections between working practices and governance from Aristotle to Aquinas to Arendt. Statecraft as a practical art to be understood and informed by the structures and methods of agriculture, navigation, fishing, hunting, cooking, mountaineering, flying, athletics, and shipbuilding. Ways in which actions produce ideas transferable to such matters of statecraft as law and diplomacy. HU

* **HUMS 353a, The World of Augustine's Confessions** Staff

A close study of the *Confessions* of Augustine. Additional readings by Vergil, Cicero, Paul, Plotinus, Tertullian, and Apuleius place Augustine's work in the intellectual context of the waning of the Roman empire and the rise of Christianity. HU TR

* **HUMS 383b, Evidence in Humanistic Inquiry** Norma Thompson and Mia Reinoso Genoni

Study of observation and judgment as the critical tools of humanistic inquiry. Textual exegesis of historical, philosophical, rhetorical, and literary works; visual analysis of paintings, prints, sculpture, architecture, and mixed media. Ways in which humans see, evaluate, and understand. HU

* **HUMS 411b, Life Worth Living** Staff

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. HU

* **HUMS 427b / ENGL 456b / JDST 316b / 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 434a / CLCV 113a / NELC 230a, Mesopotamia's Literary Legacy** Kathryn Slanski

Major works of ancient Near Eastern literature; relationships with literary traditions in the Hebrew Bible and ancient Greece. Readings include myths, epics, wisdom literature, love poetry, and humorous stories. HU

HUMS 438a / NELC 101a, Origins of Western Civilization: The Near East from Alexander to Muhammad Benjamin Foster

Cultural and historical survey of Hellenistic, eastern Roman, Parthian, Byzantine, and Sassanian empires in the Near East. Emphasis on mutual influences of Near Eastern and classical worlds, the rise of Christianity and Islam in Near Eastern contexts, and the division of East and West between conflicting ideas of unity. HU

* **HUMS 444b, 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 453b / ENGL 414b, Utopia** John Rogers

An examination of utopian fiction. Focus on works from early modern England, with some attention to more recent utopian writings. The genre's Platonic origins, its ties to early modern political philosophy, its role in the rise of the novel, and its legacy in science fiction. Utopian literature's abiding concern with issues of social discipline, religion, education, science, marriage, and sex. WR, HU

* **HUMS 464a, Self-Knowledge, Psychoanalysis, and Human Happiness** Anthony Kronman

Conceptions of self-knowledge and its relation to human happiness, with a focus on the writings of Sigmund Freud. Divisions within the soul and the prospects for integration; the psychoanalytic relation as a form of friendship; comparison of ancient and modern ideas of happiness. Preference to students who have completed Directed Studies or a comparable series of courses in ancient and modern philosophy. HU

The Franke Seminar

* **HUMS 454a / ENGL 308a / FILM 242a / LITR 398a, Interpreting Film Masterpieces**

Dudley Andrew and David Bromwich

Exploration of seven auteurs from Europe and Hollywood, 1937–1967. Assessment of methods that deepen appreciation of the films and the medium. WR, HU

The Shulman Seminar

* **HUMS 455b / PHYS 115b / THST 115b, The Physics of Dance** Sarah Demers

Konezny and Emily Coates

Critical investigation of introductory concepts in physics through the lens of dance. Topics in physics include the normal force, friction, Newton's laws, projectile motion, potential and kinetic energy, and conservation of energy. Topics in dance include aspects of dance history, contemporary artists who engage with science, and the development of movement studies. Class meetings include movement exercises. Prerequisite: basic trigonometry and algebra. Prior dance experience is not required.

QR, HU, SC

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 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 20, 2015, if the essay is to be submitted during the spring term, by April 29, 2016, for yearlong or fall-term essays. A rough draft of the essay is due at noon on March 28, 2016, for spring-term essays or on October 30, 2015, for fall-term essays. The final essay is due at noon on April 11, 2016, for spring-term essays or on December 4, 2015, for fall-term essays; late essays will be penalized by a lower grade. RP

Italian

Director of undergraduate studies: Millicent Marcus, 82–90 Wall St., 432-0599, millicent.marcus@yale.edu; language program director: Anna Iacovella, 82–90 Wall St., 432-8299, anna.iacovella@yale.edu; italian.yale.edu

FACULTY OF THE DEPARTMENT OF ITALIAN

Professors Millicent Marcus, Giuseppe Mazzotta (*Chair*)

Associate Professor Angela Capodivacca

Assistant Professor Christiana Purdy Moudarres

Senior Lectors Michael Farina, Anna Iacovella

Affiliated Faculty Francesco Casetti (*Film & Media Studies*), Roberto González Echevarría (*Spanish & Portuguese*), Joost Keizer (*History of Art*), Gundula Kreuzer (*Music*), Alastair Minnis (*English*), Frank Snowden (*History*), Gary Tomlinson (*Music, Humanities*), Francesca Trivellato (*History*), Christopher Wood (*History of Art*)

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 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.

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 director of undergraduate studies.

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. 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 director of undergraduate studies. 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 director of undergraduate studies. 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.

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 director of undergraduate studies 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 under Special Divisional Majors (p. 636).

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 director of undergraduate studies.

For information about the Year or Term Abroad program, see under Special Arrangements (p. 65) in the Academic Regulations.

Placement 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 on line during the summer; see the *Calendar for the Opening Days of College* and the departmental Web site (<http://italian.yale.edu/undergraduate/placement-testing>) for details.

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 "Simultaneous Award of the Bachelor's and Master's Degrees" under section K, Special Arrangements (<http://catalog.yale.edu/ycps/academic-regulations/special-arrangements>), in the Academic Regulations. Interested students should consult the director of undergraduate studies prior to the sixth term of enrollment for specific requirements in Italian.

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 ling for 1 of the 2 courses in other depts, with DUS permission

Senior requirement Senior essay (ITAL 491) and oral interview

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. Credit only on completion of ITAL 120. L1
1½ Course cr

*** ITAL 120b, Elementary Italian II** Staff

Continuation of ITAL 110. L2 1½ Course cr

*** ITAL 125a, Intensive Elementary Italian** Michael Farina

An accelerated beginning course in Italian that covers in one term the material taught in ITAL 110 and 120. Admits to ITAL 130 or 145. Enrollment limited to 15. L1, L2
2 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. Prerequisite: ITAL 120 or equivalent. L3
1½ Course cr

*** ITAL 140b, Intermediate Italian II** Staff

Continuation of ITAL 130. Emphasis on advanced discussion of Italian culture through authentic readings (short stories, poetry, and comic theater) and contemporary films. Admits to Group B courses. Conducted in Italian. L4

*** ITAL 145b, Intensive Intermediate Italian** Anna Iacovella

An accelerated intermediate course in Italian that covers in one term the material taught in ITAL 130 and 140. Continued practice in the four basic skills begun at the elementary level. Emphasis on grammar review, vocabulary enrichment, and appreciation of literary texts. Admits to Group B courses. Enrollment limited to 15. Prerequisite: ITAL 120 or 125. L3, L4 2 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 Karen Raizen

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 151b, Advanced Italian Workshop: Writing and Translation** Michael Farina

Development of advanced writing and speaking skills. Close readings and extensive practice writing in a variety of genres, which may include autobiography, biography, joke, letter, essay, poem, news article, comic strip, children's book, and short story.

Popular narrative genres such as the *giallo* and *romanzo rosa*. Creation and performance of short dramatic texts. L5

* **ITAL 470a or b, Special Studies in Italian Literature** Millicent Marcus

A series of tutorials to direct students in special interests and requirements. Students meet regularly with a faculty member.

* **ITAL 491a or b, The Senior Essay** Millicent Marcus

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 303b / FILM 457b / LITR 359b, Italian Film from Postwar to Postmodern**

Millicent Marcus

A study of important Italian films from World War II to the present. Consideration of works that typify major directors and trends. Topics include neorealism, self-reflexivity and metacinema, fascism and war, and postmodernism. Films by Fellini, Antonioni, Rossellini, De Sica, Visconti, Pasolini, Bertolucci, Wertmuller, Tornatore, and Moretti. Most films in Italian with English subtitles. WR, HU

* **ITAL 308a / AMST 415a, The Worlds of Antonio Gramsci** Michael Denning

Study of Antonio Gramsci (1891–1937), the Italian intellectual and Marxist thinker. Engagement with his thought and works, particularly the *Prison Notebooks*. Introduction to his world and his century, including modernism and Fordism, the worldwide diaspora of Italian migrants, the revolutionary upheavals of 1917–1919, the rise of fascism and communism, and the "new lefts" of the second half of the twentieth century. HU

ITAL 310b / LITR 183b, Dante in Translation Giuseppe Mazzotta

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. One discussion section conducted in Italian. 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 325b / LITR 186b, Italian Representations of Love from Antiquity to the Renaissance** Angela Capodivacca

Representations of love in literature, philosophy, and art from ancient Rome to the Italian Renaissance. Differences in social practices and mores over time. Works from both the classical Latin and the Italian vernacular traditions. Authors include Catullus, Ovid, Vergil, Petronius, Dante, Petrarch, Boccaccio, and Michelangelo. HU TR

Judaic Studies

Directors of undergraduate studies: Ivan Marcus, 225 HGS, 432-1379, ivan.marcus@yale.edu [F]; Christine Hayes, 451 College St., 432-0843, christine.hayes@yale.edu [Sp]; judaicstudies.yale.edu

FACULTY ASSOCIATED WITH THE PROGRAM OF JUDAIC STUDIES

Professors Joel Baden (*Divinity School*), Leslie Brisman (*English*), Steven Fraade (*Chair*) (*Religious Studies*), Paul Franks (*Philosophy*), Christine Hayes (*Religious Studies*), Hannan Hever (*Comparative Literature*), Yotam Hotam (*Religious Studies*) (*Visiting*), Daniel Lasker (*Religious Studies*) (*Visiting*), Ivan Marcus (*History*, *Religious Studies*), Moshe Rosman (*History*) (*Visiting*), Steven Smith (*Political Science*, *Philosophy*), David Sorkin (*History*), Laura Wexler (*Women's, Gender, & Sexuality Studies*, *American Studies*), Robert Wilson (*Religious Studies*)

Associate Professors Marci Shore (*History*), Eliyahu Stern (*Religious Studies*, *History*)

Senior Lecturer Peter Cole (*Comparative Literature*)

Lecturers Asaf Angermann (*Philosophy*), Shaun Halper (*History*), Margaret Olin (*Divinity School*, *History of Art*, *Religious Studies*), Liran Yadgar (*History*)

Senior Lecturer II Ayala Dvoretzky

Senior Lectors Shiri Goren, Dina Roginsky

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 an 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 as early as possible.

Requirements of the major for the Class of 2017 and previous classes Students in the Class of 2017 and previous classes may fulfill the requirements of the major in Judaic Studies that were in place when they entered the major, as described in previous editions of this bulletin (<http://www.yale.edu/printer/bulletin/archivepdf/files/YCPS>). Alternatively, they may fulfill the requirements of the major as described below for the Class of 2018 and subsequent classes.

Requirements of the major for the Class of 2018 and subsequent classes The major in Judaic Studies requires thirteen term courses, including a set of core requirements,

a language or literature requirement, 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 293; (6) a survey course in Hebrew and Jewish literature.

Language or literature requirement Students must complete either HEBR 110 and 120 or two term 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 areas of concentration. The standard areas of concentration are 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 director of undergraduate studies, students may design their own areas of concentration.

In each of the two areas of concentration, students choose three term courses in consultation with the director of undergraduate studies. These are expected to comprise one introductory course; one seminar taken in the junior year and requiring a final research paper; and one relevant course 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 director of undergraduate studies.

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 and 492), or one-term senior essay (JDST 491 or 492) and addtl sem

Core Course

JDST 200a / ER&M 219a / HIST 219a / MMES 149a / RLST 148a, Jewish History and Thought to Early Modern Times Ivan Marcus

A broad introduction to the history of the Jews from biblical beginnings until the European Reformation and the Ottoman Empire. Focus on the formative period of classical rabbinic Judaism and on the symbiotic relationships among Jews, Christians, and Muslims. Jewish society and culture in its biblical, rabbinic, and medieval settings. Counts toward either European or non-Western distributional credit within the History major, upon application to the director of undergraduate studies. HU RP

Special Project and Senior Essay Courses

* **JDST 471a or b, Individual Tutorial** Staff

For students who wish, under faculty supervision, to investigate an area in Judaic Studies not covered by regular course offerings. May be used for research or for directed reading, but in either case a long essay or several short ones are required. To apply for admission, a student should present a prospectus with bibliography and a letter of support from the faculty member who will direct the work to the director of undergraduate studies.

* **JDST 491a and JDST 492b, The Senior Essay** Ivan Marcus

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 234a / RLST 241a, Loving God in Ancient Judaism and Early Christianity** Shaun Halper

Loving God as an ideal in both Judaism and Christianity. The emergence of this ideal from its background in ancient Near Eastern literature and culture. The principle's development in the literature of ancient Israel and its expression in the literature of ancient Judaism and early Christianity. HU

* **JDST 256a / RLST 400a, The Dead Sea Scrolls and the History of Ancient Judaism: The Community Rule** Steven Fraade

Study of the Community Rule, one of the oldest and most central sectarian documents among the Dead Sea Scrolls. Its liturgical, legal, and theological contents and their influence on the organization, discipline, rhetoric, and ideology of the Qumran community and on the community's relation to other groups and movements in ancient Judaism. Prerequisite: reading proficiency in ancient Hebrew. L5, HU

MEDIEVAL AND EARLY MODERN PERIODS

* **JDST 312b / LITR 196b, Hebrew Poetry in Muslim Spain** Peter Cole

Introduction to the Golden Age of Hebrew poetry in Muslim Andalusia from the tenth century through the twelfth. Major figures of the period and the cultural and philosophical questions they confronted. The Judeo-Arabic social context in

which the poetry emerged; critical issues pertaining to the study and transmission of this literature. Readings from the works of several poets. Readings in translation. Additional readings in Hebrew available. HU TR

MODERN PERIOD

JDST 201b / HIST 220b / RLST 149b, History of Jewish Culture, 1500 to the Present

David Sorkin

A broad introduction to the history of Jewish culture from the late Middle Ages until the present. Emphasis on the changing interaction of Jews with the larger society as well as the transformation of Judaism in its encounter with modernity. HU

* **JDST 274b / HIST 219Jb, Jews of Eastern Europe, 1500–1900** Moshe Rosman
The social, economic, cultural, and political history of the Jews in historical Poland and Russia during the early modern and modern periods. Topics include law, learning, money, community, hasidism, shtetl, and war. HU

* **JDST 306b / MMES 157b / NELC 157b, Israeli Narratives** Shiri Goren
Close reading of major Israeli novels in translation with attention to how their themes and forms relate to the Israeli condition. Theories of war and peace, migration, nationalism, and gender. Authors include Yehoshua, Grossman, Matalon, Castel-Bloom, and Kashua. No knowledge of Hebrew required. HU TR

JDST 323a / MMES 160a / NELC 155a, State and Society in Israel Dina Roginsky
The interplay between the state and society in Israel. Current Israeli discourse on controversial issues such as civil rights in a Jewish-democratic state, Jewish-Arab relations, and right and left politics. Issues of orthodoxy, military service, globalization, and multiculturalism in Israel. Sociopolitical changes that have taken place in Israel since the establishment of the state in 1948 and that have led to the reshaping of Israeli Zionist ideology. HU

JDST 332a / HIST 216a / MMES 197a / RLST 193a, Zionism Shaun Halper
Introduction to the core ideas of the Zionist movement from the mid-nineteenth century to the mid-twentieth. Focus on internal Jewish debates and criticism of the movement by European and Middle Eastern intellectuals. Social, political, cultural, and messianic ideological strands within the movement and their interpretations of various historical experiences and ideas located in the Jewish tradition. HU

Language and Literature

* **JDST 316b / 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

* **JDST 339a / LITR 418a / MMES 418a / RLST 203a, Introduction to Modern Hebrew Literature** Hannan Hever

Overview of the poetics, culture, history, and political dynamics of modern Hebrew literature over the last 250 years. Readings in translation. HU

*** JDST 345a / GMAN 358a / LITR 416a, Georg Lukács: Literature and Politics**

Hannan Hever

Literary-critical, aesthetic, political, and theoretical writings of Georg Lukács. Lukács as a Jewish thinker and Marxist critic; the development of his thought against the backdrop of twentieth-century history; his influence and reception in Germany, Israel, Austria, the United States, and the Soviet Union. HU

*** JDST 391a or b / RLST 407a or b, Midrash Seminar: The Song of Moses** Steven

Fraade

Close reading of the earliest running commentary to Moses' farewell song in Deuteronomy 32, as found in the collection *Sifre Haazinu*. The rhetoric and early rabbinic methods of scriptural interpretation; the commentary's place in the history of interpretation and its contributions to the historical study of ancient Jewish society and culture. Prerequisite: reading fluency in ancient Hebrew. L5, HU

*** JDST 401b / HEBR 152b, Reading Academic Texts in Modern Hebrew** Dina

Roginsky

Reading of academic texts in modern Hebrew, for students with a strong background in Hebrew. Discussion of grammar and stylistics; special concentration on the development of accuracy and fluency. Prerequisite: HEBR 150 or permission of instructor. Conducted in Hebrew. L5 RP

*** JDST 405a / HEBR 156a / MMES 216a, Dynamics of Israeli Culture** Shiri Goren

Controversies in Israeli society as revealed in novels, films, poetry, newspaper articles, Web sites, art, advertisements, and television shows. Themes include migration and the construction of the Sabra character; ethnicity and race; the emergence of the Mizrahi voice; women in Israeli society; private and collective memory; the minority discourse of the Druze and Russian Jews; and Israeli masculinity and queer culture. Conducted in Hebrew. Papers may be written in English or Hebrew. Prerequisite: HEBR 140 or permission of instructor. L5, HU RP

JDST 407b / HEBR 161b / MMES 156b, Israeli Popular Music Dina Roginsky

Changes in the development of popular music in Israel explored as representations of changing Israeli society and culture. The interaction of music and cultural identity; modern popular music and social conventions; songs of commemoration and heroism; popular representation of the Holocaust; Mizrahi and Arab music; feminism, sexuality, and gender; class and musical consumption; criticism, protest, and globalization. Conducted in Hebrew. Prerequisite: HEBR 140 or equivalent. L5

*** JDST 409a / HEBR 159a / MMES 159a, Conversational Hebrew: Israeli Media**

Shiri Goren

An advanced Hebrew course for students interested in practicing and enhancing conversational skills. Focus on listening comprehension and on various forms of discussion, including practical situations, online interactions, and content analysis. Prerequisite: HEBR 140 or permission of instructor. L5 RP

Latin American Studies

Director of undergraduate studies: Aníbal González, Rm. 226, 82–90 Wall St., 432-1149, anibal.gonzalez@yale.edu; www.yale.edu/macmillan/lais

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 Jafari Allen (*Anthropology, African American Studies*), 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*), Dixia Ramirez (*American Studies, Ethnicity, Race, & Migration*)

Senior Lectors II Margherita Tortora, Sonia Valle

Senior Lectors Sybil Alexandrov, Marta Almeida, Maria 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 Safille, Terry Seymour

Lector Selma Vital

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 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. Though all students choose courses in both the humanities and the social sciences, they are expected to concentrate on one or the other.

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 director of undergraduate studies. 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.

The major itself requires twelve term courses: one introductory course approved by the director of undergraduate studies; 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, and one course in art, architecture, film and media studies, music, or theater studies. Students wishing to count toward the major courses that do not appear in the program's course offerings should consult with the director of undergraduate studies.

Students must enroll in three seminars or upper-level courses during their junior and senior years. Elective seminars must be approved by the director of undergraduate studies, who can provide a list of appropriate courses.

The senior essay 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 (<http://www.yale.edu/macmillan/lais>) 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 Web site (<http://studentgrants.yale.edu>).

Other courses relevant to the major A list of courses intended as a guide to students in preparing their programs is available at the office of the director of undergraduate studies and on the Council on Latin American and Iberian Studies Web site (<http://www.yale.edu/macmillan/lais/undergraduate.html>). 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 director of undergraduate studies.

Study abroad Students are strongly encouraged to take advantage of study abroad opportunities during summers or through the Year or Term Abroad program (p. 65).

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

Senior requirement Senior essay (LAST 491)

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.

AFAM 110a / AMST 161a, Freedom and Identity in Black Cultures Jafari Allen
Introduction to major themes and topics in African American experiences; basic methods of interdisciplinary analysis and interpretation in African American studies. Topics include black economic, political, and social institutions; self-identity and social status; literature, art, film, and music; and political and social issues and their relationship to changing social structures. HU, SO

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 353a / MUSI 353a, Topics in World Music** Michael Veal
A critical introduction to selected cultures of world music. Specific cultures vary from year to year but generally include those of Native America, South Asia, Southeast Asia, sub-Saharan Africa, the Middle East, and the Caribbean. Preference to Music majors according to class. HU

* **AFST 486a / HIST 388Ja, Slavery and the Slave Trade in Africa** Robert Harms
The slave trade from the African perspective. Analysis of why slavery developed in Africa and how it operated. The long-term social, political, and economic effects of the Atlantic slave trade. WR, HU

* **AMST 441b / ER&M 370b / HIST 130Jb, 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

* **ANTH 301a, Foundations of Modern Archaeology** Richard Burger
Discussion of how method, theory, and social policy have influenced the development of archaeology as a set of methods, an academic discipline, and a political tool. Background in the basics of archaeology equivalent to one introductory course is assumed. SO

* **ANTH 438b, Culture, Power, Oil** Douglas Rogers
The production, circulation, and consumption of petroleum as they relate to globalization, empire, cultural performance, natural resource extraction, and the nature of the state. Case studies include the United States, Saudi Arabia, Nigeria, Venezuela, and the former Soviet Union. SO
Anthropology: Sociocultural

ECON 325a, Economics of Developing Countries Nancy Qian
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. After introductory microeconomics and econometrics. SO

* **ECON 412a, International Environmental Economics** Joseph Shapiro
Introduction to international and environmental economics and to research that combines the two fields. Methods for designing and analyzing environmental policy when economic activity and pollution cross political borders. Effects of market openness on the environment and on environmental regulation; international economics and climate change. Prerequisites: intermediate microeconomics and econometrics. SO

* **ECON 465a / EP&E 224a / GLBL 330a, Debating Globalization** Ernesto Zedillo
Facets of contemporary economic globalization, including trade, investment, and migration. Challenges and threats of globalization: inclusion and inequality, emerging global players, global governance, climate change, and nuclear weapons proliferation. Prerequisite: background in international economics and data analysis. Preference to seniors majoring in Economics or EP&E. SO RP

* **ECON 467b / GLBL 307b, Economic Evolution of the Latin American and Caribbean Countries** Ernesto Zedillo
Economic evolution and prospects of the Latin American and Caribbean (LAC) countries. Topics include the period from independence to the 1930s; import substitution and industrialization to the early 1980s; the debt crisis and the "lost decade"; reform and disappointment in the late 1980s and the 1990s; exploration of selected episodes in particular countries; and speculations about the future. Prerequisites: intermediate microeconomics and macroeconomics. SO

[**ER&M 200, Introduction to Ethnicity, Race, and Migration**]

* **ER&M 300b, Comparative Ethnic Studies** Birgit Rasmussen
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 / F&ES 384a, Environmental Anthropology** Michael Dove
History of the anthropological study of the environment: 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 freshmen. Preregistration required; see under Freshman Seminar Program. WR

GLBL 247b / PLSC 128b, Development under Fire Jason Lyall
The recent emergence of foreign assistance as a tool of counterinsurgency and post-conflict reconciliation. Evaluation of the effects of aid in settings such as Afghanistan, Iraq, Colombia, and the Philippines. Examination of both theory and practice of conducting development work in the shadow of violence. Strengths and weaknesses of

different evaluation methods, including randomized control trials (RCTs) and survey experiments. SO

Global Affairs: Security

Global Affairs: Development

* **HSAR 471a / AFAM 346a, Black Atlantic Photography** Kobena Mercer

Introduction to the social and artistic history of photography in Black Atlantic contexts from the mid-nineteenth century to the present. Uses of the photographic image in shaping understandings of race relations and black identities. Codes and conventions by which photographs are evaluated in terms of truth, reflection, testimony, expressivity, and construction. 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 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 200-level course may count as an elective toward the Spanish major.

L5

* **LAST 223b / SPAN 223b, 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. A maximum of one 200-level course may count as an elective toward the Spanish major. 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. A maximum of one 200-level course may count as an elective toward the Spanish major. 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 200-level course 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. A maximum of one 200-level course may count as an elective toward the Spanish major. 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 Hapsburg Spain and Its New World 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 254b / PORT 355b, Brazilian Modernist Poetry** K. David Jackson

The generation of major poets who were part of Brazilian modernism, centered on the "Modern Art Week" of 1922. Poetry written to express the individuality and character of Brazil's language and culture at the onset of modernization, urbanization, and industrialization. Points of analysis include form, use of language, themes of memory and modernization, cultural characterization, humor, and ethical and existential concerns. Prerequisite: PORT 140 equivalent. L5, HU

*** LAST 255b / ANTH 255b / ARCG 255b, Inca Culture and Society** Richard Burger

The history and organization of the Inca empire and its impact on the nations and cultures it conquered. The role of archaeology in understanding the transformation of Andean lifeways; the interplay between ethnohistoric and archaeological approaches to the subject. SO

LAST 261a / SPAN 261a, Studies in Spanish Literature I Susan Byrne

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 Bécquer, Unamuno, Lorca, Sender, Machado, and Cernuda. Open to students who have placed into L5 courses or who have successfully completed an L4 course in Spanish. L5, HU

*** LAST 346a / PLSC 365a, Journalism, Cinema, and Human Rights in Latin America** Michael Reed Hurtado

The role of news and entertainment media in the protection of human rights in Latin America. Recurrent human rights problems in the region, and legal and political responses to them. Topics include enforced disappearances of persons; extrajudicial

executions; armed conflict; national security doctrine; amnesties and gross violations; the struggle against impunity; victims' rights to truth, justice, and reparations; and the rights of prisoners. SO

* **LAST 348a / AFST 347a / EP&E 484a / GLBL 243a / PLSC 347a, Post-Conflict Politics** David Simon

Consideration of a range of issues and challenges faced by countries emerging from domestic conflict. Focus on elements of peace-building—disarmament and demobilization, post-conflict elections, institution-building, and reconstruction—as well as modes of transitional justice and mechanisms for truth and reconciliation. SO

* **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 356b / ER&M 270b / HIST 358Jb, History of Mexico since Independence**
Gilbert Joseph

Modern Mexico from the wars of independence in the early nineteenth century to the present. Social, cultural, and economic trends and their relationship to political movements; particular emphasis on the Revolution of 1910 and the long shadow it has cast, and on patterns of relations with the United States. WR, 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 396b / LITR 292b / PORT 396b, Modern Brazilian Literature in Translation
K. David Jackson

Study of major writers, movements, and works in Brazilian literature, including drama, poetry, essay, manifesto, memoir, and fiction. Introduction to canonical writers, works, and movements, including naturalism, realism, modernism, social realism, innovative writing, and postmodern trends. General introduction to key concepts in Brazilian civilization. Conducted in English. WR, HU TR

* **LAST 410b / ECON 462b / EP&E 228b / GLBL 316b, The Economics of Human Capital in Latin America** Douglas McKee

Economic issues related to a population's education, skills, and health; focus on contemporary Latin American societies. Determinants of health and education; evaluation of human capital development policies; the role of human capital in a variety of economic contexts, including the labor market, immigration, child investment,

intra-household bargaining, inequality, and poverty. Prerequisites: intermediate microeconomics and econometrics. SO

*** LAST 416a / GBL 189a / HLTH 325a, Methods and Ethics in Global Health**

Research Leslie Curry

Introduction to research methods in global health that recognize the influence of political, economic, social, and cultural factors. Quantitative, qualitative, and mixed-method approaches; ethical aspects of conducting research in resource-constrained settings; the process of obtaining human subjects' approval. Students develop proposals for short-term global health research projects conducted in resource-constrained settings. SO RP

*** LAST 423b / EP&E 243b / GBL 336b / PLSC 423b, 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 148b, Theories, Practices, and Politics of Human Rights David Simon

Introduction to core human-rights issues, ideas, practices, and controversies. The concept of human rights as a philosophical construct, a legal instrument, a political tool, an approach to economic and equity issues, a social agenda, and an international locus of contestation and legitimation. Required for students in the Human Rights Undergraduate Scholars program. SO

*** PLSC 152a / EP&E 245a, Global Firms and National Governments** Joseph

LaPalombara

The type and magnitude of foreign direct investments made by a relatively small number of large firms, and the political influence such firms exercise. Complex challenges raised by powerful global firms emerging from once-dependent and less-developed countries such as China, India, and Brazil. Discussion of the present and probable future relationships between economic and governmental organizations that result from the processes of globalization. Case studies illustrate specific problems faced by both corporate leaders and national and subnational public-policy officials. SO

*** PLSC 399a / EP&E 257a, Politics in Latin America** Ana De La O

Overview and analysis of politics in Latin America. The emergence of democracy and the forces that led to the unprecedented increase in inequality in the twentieth century. Topics include institutional design, historical legacies, corruption, clientelism, and violence.

PLSC 415b / SOCY 172b, Religion and Politics Sigrun Kahl

Challenges to the view of religion as an archaic force destined to dwindle away in a secularized society. A historical and comparative investigation of the relationship between religion and politics in Europe and the United States, with comparisons to the Muslim world. SO

*** PLSC 428a / EP&E 240a / GBL 333a, Comparative Welfare Policy in Developing**

Countries Jeremy Seekings

Examination of public and private welfare systems in the developing world. Analysis of the evolving relationships between kin or community and states and market. Particular attention to the politics of contemporary reforms. SO

* **PORT 410a / LITR 291a, The Brazilian Short Story in Translation** K. David Jackson
The Brazilian short story from Machado de Assis to the present, confronting the European literary background with Brazilian linguistic, indigenous, and cultural realities. Authors from four literary periods, including Guimarães Rosa and Clarice Lispector, and dominant critical and thematic currents. Conducted in English. WR, HU
TR

* **SPAN 250a, Composition and Analysis** Leslie Harkema
Composition in Spanish, with a focus on academic writing. Close analysis of language use in literary texts to improve fluidity and precision in students' own writing. Frequent composition assignments to practice the forms and functions studied. 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, 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: Raffaella Zanuttini, 209 DOW, 432-2452,
raffaella.zanuttini@yale.edu; ling.yale.edu

FACULTY OF THE DEPARTMENT OF LINGUISTICS

Professors Stephen Anderson, Robert Frank (*Chair*), † Roberta Frank, Laurence Horn (*Emeritus*), † Frank Keil, † Joshua Knobe, † Jason Stanley, † Zoltán Szabó, Petronella Van Deusen-Scholl (*Adjunct*), Raffaella Zanuttini

Associate Professors Claire Bownern, Ashwini Deo, Maria Piñango, Kenneth Pugh (*Adjunct*)

Assistant Professor Ryan Bennett

Lecturers Hannah Haynie, Jim Wood

† A joint appointment with primary affiliation in another department.

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.

Students with no previous background in linguistics are encouraged to approach the field by taking a 100-level course.

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 director of undergraduate studies, 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.
5. 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.

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 Simultaneous Award of the Bachelor's and Master's Degrees under Special Arrangements (p. 65) in the Academic Regulations. 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

Senior requirement LING 491

Introductory Courses

Courses in this group do not require previous study of linguistics.

*** LING 005a, The Mental Lexicon** Maria Piñango

Examination of the mental lexicon, a hypothesized space in the mind that is built on long-term memory and that holds and manipulates the basic building blocks of language. The structure of this space as it is currently understood; subsystems connected by the mental lexicon, including word structure, sound structure, and meaning structure; real-time word processing and bilingualism. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. SO

[LING 006, Languages of the World]

[LING 007, Varieties of English]

*** LING 010b / HIST 013b, Language and Power** Claire Bowers and Alejandra Dubcovsky-Joseph

The relationships between language and power explored through the perspectives of linguistics and history. How and when languages change, disappear, and are created. Focus on the Americas and on four outcomes of language contact and their social precursors: pidgins, creoles, mixed languages, and language death. Enrollment limited to freshmen. Preregistration required; see under Freshman Seminar Program. SO

[LING 107, Linguistic Diversity and Endangerment]

LING 109b / ENGL 149b, History of the English Language Roberta Frank

The evolution of English from its beginnings nearly 1500 years ago to the language of *Beowulf*, Chaucer, Shakespeare, Milton, Jane Austen, Melville, Twain, Langston Hughes, Woody Allen, Maya Angelou, and Kendrick Lamar. An overview of the 'Englishes' that populate our globe, including a look at the ways that technology affects language. HU

LING 110a, Language: Introduction to Linguistics Jim Wood

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 112a, Historical Linguistics Claire Bowers

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. HU

*** LING 115a / SKRT 110a, Introductory Sanskrit I** David Brick

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, 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 117a / PSYC 137a, Language and Mind Maria Piñango

Knowledge of language as a component of the mind: mental grammars, the nature and subdivisions of linguistic knowledge in connection with the brain. The logical problem of language acquisition. The "universal grammar hypothesis" according to which all humans have an innate ability to acquire language. The connection between language acquisition and general cognitive abilities. SO

[**LING 130, Evolution of Language**]

LING 138a / SKRT 130a, Intermediate Sanskrit I David Brick

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 1½ Course cr

[**LING 140, Computational Models in Cognitive Science**]

* **LING 150a / ENGL 150a, Old English** Roberta Frank

An introduction to the 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*, all read in the original Old English. HU

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 200, Experimentation in Linguistics**]

* **LING 211b, Grammatical Diversity in U.S. English** Raffaella Zanuttini

Study of differences among varieties of English spoken in North America, focusing in particular on morphosyntactic variation: double modals ("I might could go to the store"), negative inversion ("Don't nobody want to ride the bus"), aspect marking ("Bruce be running," "I done pushed it"), "drama SO" ("I am SO not going to study tonight"), personal datives ("I need me a new printer"), positive "anymore" ("Gas is expensive anymore"). Emphasis on the grammatical richness and complexity of each variety. Debunking of the prejudice against examples of a natural grammatical diversity. Prerequisite: LING 253, or with permission of instructor. SO

LING 212b, Linguistic Change Stephen Anderson

Principles governing linguistic change in phonology and morphology. Status and independence of proposed mechanisms of change. Relations between the principles of historical change and universals of language. Systematic change as the basis of linguistic comparison; assessment of other attempts at establishing linguistic relatedness. Prerequisites: LING 112, 232, and 253. SO

* **LING 219a / ANTH 380a, The Evolution of Language and Culture** Claire Bowern

Introduction to cultural and linguistic evolution. How diversity evolves; how innovations proceed through a community; who within a community drives change;

how changes can be "undone" to reconstruct the past. Methods originally developed for studying evolutionary biology are applied to language and culture. WR, SO

LING 220b / PSYC 318b, General Phonetics Ryan Bennett

Investigation of possible ways to describe the speech sounds of human languages. Acoustics and physiology of speech; computer synthesis of speech; practical exercises in producing and transcribing sounds. SO

* **LING 224a, Formal Foundations of Linguistic Theories** Staff

Study of formal systems that play an important role in the scientific study of language. Exploration of a range of mathematical structures and techniques; demonstrations of their application in theories of grammatical competence and performance including set theory, graphs and discrete structures, algebras, formal language, and automata theory. Evaluation of strengths and weaknesses of existing formal theories of linguistic knowledge. QR, SO

LING 227b / PSYC 327b, Language and Computation Staff

Design and analysis of computational models of language. Topics include finite state tools, computational morphology and phonology, grammar and parsing, lexical semantics, and the use of linguistic models in applied problems. Prerequisite: Prior programming experience or permission of instructor. QR, SO

LING 231b / PSYC 331b, Neurolinguistics Maria Piñango

The study of language as a cognitive neuroscience. The interaction between linguistic theory and neurological evidence from brain damage, degenerative diseases (e.g., Alzheimer's disease), mental illness (e.g., schizophrenia), neuroimaging, and neurophysiology. The connection of language as a neurocognitive system to other systems such as memory and music. SO

LING 232a, Introduction to Phonological Analysis Ryan Bennett

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. (Formerly LING 132) SO

LING 233b, The Literate Brain and Mind Kenneth Pugh

The neurobiological and cognitive foundations of reading and writing. Emerging research on gene-brain-behavior analyses of typically and atypically developing readers. The relationship between speech perception/production and individual differences in literacy learning; distributed brain circuits that support word reading, text comprehension, and second-language learning; the neurobiology of acquired and developmental reading and writing disorders. SO

* **LING 235b, Phonological Theory** Staff

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 241a, Field Methods** Ryan Bennett

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 in Linguistics, and to others with permission of instructor.

SO

[**LING 247, Indigenous Languages of Australia**]

* **LING 251a, Learnability and Development** Staff

An investigation of language learning from an integrated perspective of computational modeling and language development. The mutually informing relationships between computational modeling, linguistic theory, and language acquisition. Prerequisite:

LING 232 or permission of instructor. Recommended preparation: LING 227. SO

LING 253a, Syntax I Raffaella Zanuttini

An introduction to the syntax of natural language. Generative syntactic theory and key theoretical concepts. Syntactic description and argumentation. Topics include the structure of clauses and noun phrases, movement operations, and the notion of parameter. (Formerly LING 153) SO

LING 254b, Syntax II Robert Frank

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 Ashwini Deo

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 267a, Aspectual Phenomena in Language** Staff

Introduction to core phenomena pertaining to lexical and grammatical aspect. Key aspectual properties and how they may be lexically present or derived through composition with arguments, adverbial modifiers, and grammatical aspect markers. The relation between aspectual properties and temporal reference. After or concurrently with LING 263, or with permission of instructor. SO

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 280b, Morphology** Stephen Anderson

The theory of word structure within a formal grammar. Relation to other areas of grammar (syntax, phonology); basic units of word structure; types of morphology (inflection, derivation, compounding). Prerequisites: LING 232 and 253, or permission of instructor. SO

Advanced Courses and Seminars

* LING 334b, Experimental Semantics Maria Piñango

The structure of meaning as part of the human cognitive system. How language use, which is serial and local in nature, is able to package meaning, which is multidimensional and atemporal. Psycholinguistic and cognitive modeling of core phenomena in lexical and compositional semantics. Readings from the fields of neurocognition and cognitive psychology, model-theoretic and lexico-conceptual semantics, and pragmatics. Prerequisite: LING 005, 110, 117, 260, 263, or CGSC 110, or with permission of instructor. SO

[LING 341, Topics in Phonology: Prosody at the Interfaces]

* LING 349b, Topics in Phonology: The Phonetics-Phonology Interface Ryan Bennett

The relationship between phonology, as the mental representation of speech, and phonetics, as the physical substance of speech. Universal and language-particular phonetics; phonetic knowledge as grammatical knowledge; phonetic detail in phonological representation and computation; unified vs. modular conceptions of the phonetics-phonology divide; the shaping of phonological systems by phonetic pressures; the shaping of phonetic patterning by phonological structure. Prerequisites: LING 220 and 235, or with permission of instructors. SO

[LING 355, Doubling in Syntax]

[LING 360, Topics in Syntax: Compositional Syntax]

* LING 365b, Semantic Change Ashwini Deo

Investigation of systematic change in the domain of semantics and pragmatics. Empirical phenomena include grammaticalization in the domain of tense, aspect, and modality markers, markers of location and possession, and negation, as well as intensifiers. Focus on reconciling grammaticalization and typological research with formal semantic studies. Prerequisite: LING 263 or permission of instructor. SO

[LING 372, Meaning, Concepts, and Words]

[LING 390, Negation and Polarity]

Research Courses

* LING 471a and LING 472b, Special Projects Raffaella Zanuttini

Special projects set up by students with the help of a faculty adviser and the director of undergraduate studies to cover material not otherwise offered by the department. The project must terminate with at least a term paper or its equivalent and must have the approval of the director of undergraduate studies. Only one term may be offered toward the major; two terms may be offered toward the bachelor's degree.

* 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** Raffaella Zanuttini

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 205b, 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. SO

ANTH 231a, Introduction to Linguistic Anthropology Paul Kockelman

Critical approaches to popular culture in Africa and African history. Questions include what "popular" means in popular culture; who becomes the "popular" and under what conditions; how forms of popular culture comment on social experience; and what happens when those forms are co-opted. Case studies include the reception of soap operas in Egypt, the ambiguity of political authority in Cameroonian cartoons, and the global aspirations of Tanzanian barbershop owners. Forms of popular culture that intersect and overlap in and around southern Africa's mines and in the context of informal urban economies. SO

* **ANTH 333a, Bilingualism in Social Context** J. Joseph Errington

The linguistic phenomenon of bilingualism presented through broad issues in social description inseparably linked to it: growth and change in bilingual communities; bilingual usage, social identity, and allegiance; and interactional significances of bilingual speech repertoire use. SO

Anthropology: Linguistic

* **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

Anthropology: Linguistic

CGSC 110a / PSYC 130a, Introduction to Cognitive Science April Ruiz

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

* **CHLD 128b / EDST 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

CPSC 201a or b, Introduction to Computer Science Stephen Slade

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

Math: Stat/Applied Math

[CPSC 430, Formal Semantics]

CPSC 470a, Artificial Intelligence Drew McDermott

Introduction to artificial intelligence research, focusing on reasoning and perception. Topics include knowledge representation, predicate calculus, temporal reasoning, vision, robotics, planning, and learning. After CPSC 201 and 202. QR

CPSC 472a, Intelligent Robotics Katherine Tsui

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.

GREK 390a, Greek Syntax and Stylistics Victor Bers

A review of accident and syntax, elementary composition, and analysis of Greek prose styles of the fifth and fourth centuries B.C., including a comparison of "prosaic" and "poetic" syntax. Prerequisite: previous familiarity with some Greek prose beyond the elementary level, or permission of instructor. L5, HU

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 Bruno Whittle

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 267a, 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

Math: Logic/Foundations

* **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

Math: Logic/Foundations

* **PHIL 446b, Philosophy of Language: Situations and Events** Zoltán Szabó

Unification of event semantics and situation semantics. Questions about the underlying metaphysics of the resulting theory. Prerequisites: a course in logic and an advanced course in metaphysics or semantics. HU

Literature

Director of undergraduate studies: David Gabriel, Rm. 102, 451 College St., 432-4750, maryjane.stevens@yale.edu; complit.yale.edu/literature-major

FACULTY OF THE LITERATURE MAJOR

Professors Dudley Andrew, Peter Brooks (*Emeritus*), Katerina Clark, Roberto González Echevarría, Martin Hägglund, Benjamin Harshav (*Emeritus*), Geoffrey Hartman (*Emeritus*), Hannan Hever, Michael Holquist (*Emeritus*), Carol Jacobs, Rainer Nägele, David Quint, Katie Trumpener, Jing Tsu

Associate Professor Moira Fradinger

Assistant Professors Robyn Creswell, Marta Figlerowicz, David Gabriel, Ayesha Ramachandran

Senior Lecturer Peter Cole

Lecturers Jan Hagens, George Syrimis

Senior Lectors Candace Skorupa, Howard Stern

Affiliated Faculty Rolena Adorno (*Spanish & Portuguese*), R. Howard Bloch (*French*), Rüdiger Campe (*German*), Francesco Casetti (*Film & Media Studies*), Kang-i Sun Chang (*East Asian Languages & Literatures*), Michael Denning (*American Studies*), Wai Chee Dimock (*English*), Paul Fry (*English*), Beatrice Gruendler (*Near Eastern Languages & Civilizations*), Karsten Harries (*Philosophy*), 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*), Henry Sussman (*German*) (*Visiting*), Christopher Wood (*History of Art*), Ruth Yeazell (*English*)

The Literature Major allows students to address fundamental questions about the nature, function, and value of literature in a broadly comparative context. Majors read and write about a wide variety of literary works across periods, genres, and national traditions. They investigate traditional and contemporary approaches to literary study, ancient and modern literary theory, and the relationship of literature to film and to other branches of the arts and sciences.

The Literature Major offers students the freedom to construct a program of study that reflects their intellectual goals. All students planning to major in Literature should register with the director of undergraduate studies, who will work with them to develop a coherent, well-focused sequence of courses suited to their individual interests.

The major offers a number of its own courses, which constitute the core of the program. 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 (p. 94), Classics (p. 192), East

Asian Languages and Literatures (p. 225), English (p. 279), Film and Media Studies (p. 333), French (p. 344), German (p. 369), Italian (p. 437), Near Eastern Languages and Civilizations (p. 535), Portuguese (p. 579), Slavic Languages and Literatures (p. 604), and Spanish (p. 630). Courses in film and media studies count toward the major in the same way as courses in literature. Students with a particular interest in film or in translation studies may wish to elect the film track or translation track within the Literature major, described below.

The experience of reading a foreign literature in the original language enables us to understand the nature of both language and literature more fully. Prospective Literature 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.

Prerequisites Completion of the Yale College foreign language distributional requirement is a prerequisite for entry into the major. Prospective majors must also complete LITR 120 and LITR 122, which may be taken in either order.

The standard major Beyond the prerequisites, the Literature Major requires twelve term courses. These include LITR 300, which should be taken in the sophomore or junior year. Also required are two core seminars, one pre-1800 course, one course in drama or poetry, three courses in a foreign literature with readings in the original language, three elective courses, and the senior essay. The 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 in literature, such as history of art, philosophy, anthropology, music, or theater studies. One of the elective courses may be in creative writing.

Core seminars In core seminars, LITR 400–480, students focus intensively on particular texts, films, literary and cultural issues, and theoretical problems. Students are required to take at least two core seminars, preferably one in the junior and one in the senior year. The seminars provide training in literary interpretation and theory, preparing students for the senior essay.

Pre-1800 course requirement The Literature Major requires at least one course in literature before 1800. Because both genres and individual works of literature refer to, emulate, challenge, and rewrite older works and conventions, students benefit from acquiring a degree of historical perspective. Courses numbered LITR 150–199 fulfill the pre-1800 requirement; courses from other departments may also fulfill the requirement.

Poetry or drama requirement In addition to LITR 122 and the pre-1800 course, all students must take one course in poetry or drama. The course may be one offered in a program other than Literature.

Foreign literature requirement All majors are required to take at least three additional term courses, beyond the foreign language distributional requirement, in an ancient or modern foreign literature, in which the literature is read in the original language. One or more courses can be taken at a basic literature level (normally equivalent to the third year of language study); however, at least one course must be taken at an advanced

level (normally equivalent to the fourth year of language study or higher). Students are encouraged to continue developing their foreign language skills by taking advanced language courses and may, with permission of the director of undergraduate studies, substitute one language course at the L5 level for one of the three required foreign literature courses.

A literature course in translation is sometimes suitable as a foreign literature course. In such cases, Literature majors are expected to request additional assignments from their instructors that demonstrate they have engaged with the texts in the original language. They should fill out a form, signed by the instructor, attesting to their intent to do so. This form is available in the department office in Room 102, 451 College St.; students should submit it to the director of undergraduate studies along with their course schedule.

Nonnative 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 Major, or they may fulfill the major requirements in a third language.

The senior essay In the senior essay, required of all majors, students develop a research topic of their choice and work closely with a faculty adviser. Normally, the essay makes use of texts in the language of their original composition. Any exceptions must be approved by the director of undergraduate studies. Deadlines for the prospectus, the rough draft, and the completed essay are listed in the course descriptions of the senior essay course (LITR 491 and 492, 493).

The senior essay may be written over one term (LITR 491) or over two terms (LITR 492, 493). Alternatively, students may fulfill the senior essay requirement within the context of a core seminar (the senior seminar essay). Because no more than five students per seminar may elect this option, students should petition the instructor promptly at the beginning of the term. It is understood that students choosing the senior seminar essay will work closely with the instructor throughout the term and produce a substantial paper, approximately thirty pages. Students earn one course credit for the seminar in which the essay is written; no additional course credit is awarded for the essay itself.

Students with an especially well-developed project may petition to write a yearlong senior essay. Interested juniors must apply to the director of undergraduate studies 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 director of undergraduate studies by the last day of classes in the fall term.

Credit/D/Fail For students in the Class of 2017 and previous classes, a maximum of one course taken Credit/D/Fail may count toward the major, with permission of the director of undergraduate studies. For students in the Class of 2018 and subsequent

classes, a maximum of two courses taken Credit/D/Fail may count toward the major, with permission of the director of undergraduate studies.

Film track Students may elect to pursue a film-intensive concentration within the Literature Major. Students in the film track must fulfill the same requirements as those in the standard Literature track, with the following exceptions. Film-track students take LITR 143 instead of LITR 122 as one of the prerequisites to the major. They take two foreign literature courses rather than three; neither 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 may elect to pursue a translation concentration within the Literature Major. Students in the translation track must fulfill the same requirements as those in the standard Literature track, with the following exceptions. Instead of LITR 122, translation-track students take as one of the prerequisites to the major LITR 348 or another course in the theory and practice of translation approved by the director of undergraduate studies. Translation-track students must also choose their three electives from courses that engage with some aspect of translation studies; the office of the director of undergraduate studies maintains a list of qualifying courses.

Intensive major Students in the intensive major complete three courses each in two non-anglophone literatures, in all of which the literature is read in the original language. Three of these courses take the place of the three electives in the non-intensive major. Intensive majors must also demonstrate proficiency at the L₅ level in one of their languages and at the L₄ level or above in the other. Students taking the intensive major in three national literatures must take two courses each in two national literatures and three in a third. They must demonstrate proficiency at the L₅ level in the language of their principal literature, and at the L₄ level or above in the other two.

Year or term abroad The Literature Major encourages students to consider spending a summer, a term, or a year abroad. Courses taken on international programs may, with permission of the director of undergraduate studies, be applied to the Literature Major's foreign literature requirement.

Foreign literature courses 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 major. 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.

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

Other ancient and modern languages, including those from Africa, South Asia, and the Middle East, may be suitable for the Literature Major if a qualified faculty adviser is available to supervise the major.

REQUIREMENTS OF THE MAJOR

Prerequisites *All tracks*—LITR 120; completion of Yale College foreign lang distributional req; *Standard track*—LITR 122; *Film track*—LITR 143; *Translation track*—LITR 348 or equivalent

Number of courses 12 term courses beyond prereqs (incl senior essay)

Specific course required LITR 300

Distribution of courses *All tracks*—1 course in lit before 1800; 1 course in poetry or drama; 2 core sems; *Standard track*—3 courses in 1 foreign lit, as specified; 3 electives, as specified; *Film track*—2 courses in 1 foreign lit, as specified; 1 course in film theory; 3 electives in film & media studies; *Translation track*—3 courses in 1 foreign lit, as specified; 3 electives in translation studies

Substitution permitted *Standard and translation tracks*—1 advanced lang course for 1 of 3 req foreign lit courses, with DUS permission

Senior requirement One-term senior essay (LITR 491); or two-term senior essay (LITR 492 and 493); or 1 core sem (LITR 400–480) with senior sem essay

Intensive major 3 addtl courses in a second foreign lang in place of 3 electives; demonstrated command of the second foreign lang to L4 level

Prerequisites and Required Courses

LITR 120a, Introduction to Narrative Staff

A team-taught course that examines how narratives work and what they do. Emphasis on fictional form, the mechanics of plot, and questions of time and duration. Texts are drawn from a variety of periods and cultures, and include folktales, short stories, novels, case studies, graphic novels, and films. WR, HU

LITR 122b, World Poetry and Performance Staff

A team-taught course that examines lyric and epic poetry, drama, film, song, and performance. Texts are drawn from a broad range of cultures and time periods.

Emphasis on how poetic and dramatic forms shape the stories they tell, on the social and cultural uses to which these forms are put, on the relationship between text and performance, and on historical and cross-cultural connections among texts. WR, HU

LITR 143b / FILM 240b, World Cinema Dudley Andrew

Development of ways to engage films from around the globe productively. Close analysis of a dozen complex films, with historical contextualization of their production and cultural functions. Attention to the development of critical skills. Includes weekly screenings, each followed immediately by discussion. HU

LITR 300b / ENGL 300b, Introduction to Theory of Literature Martin Hägglund

An examination of concepts and assumptions in contemporary views of literature. Theories of meaning, interpretation, and representation. Critical analysis of formalist, psychoanalytic, structuralist, poststructuralist, Marxist, and feminist approaches to theory and to literature. HU

The Ancient World

* **LITR 154a / ENGL 395a, The Bible as 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. Pre-1800 with completion of supplementary assignments in the language of the King James Bible. If there is sufficient interest, a second section will be offered. WR, HU RP

* **LITR 166b / CLCV 221b, Imperialisms Ancient and Modern** Christina Kraus

Works of Greek and Latin literature that address the material advantages furnished by imperialism and the moral cost at which they are purchased. Comparison with films, graphic novels, and art installations that engage with similar issues in relation to modern empires. Current problems of globalization and imperialism situated in the context of historical empires. HU

* **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 183b / ITAL 310b, Dante in Translation Giuseppe Mazzotta

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. One discussion section conducted in Italian. HU TR

* **LITR 186b / ITAL 325b, Italian Representations of Love from Antiquity to the Renaissance** Angela Capodivacca

Representations of love in literature, philosophy, and art from ancient Rome to the Italian Renaissance. Differences in social practices and mores over time. Works from both the classical Latin and the Italian vernacular traditions. Authors include Catullus, Ovid, Vergil, Petronius, Dante, Petrarch, Boccaccio, and Michelangelo. HU TR

LITR 191b / FREN 310b, Louis XIV and the Culture of Absolutism Christopher Semk

An exploration of the major literary works of seventeenth-century France, with special emphasis on the relationship between absolutism and cultural life. Artistic patronage and the institutionalization of the arts, support for and subversion of royal authority, and the characteristics of classical style. HU

* **LITR 196b / JDST 312b, Hebrew Poetry in Muslim Spain** Peter Cole

Introduction to the Golden Age of Hebrew poetry in Muslim Andalusia from the tenth century through the twelfth. Major figures of the period and the cultural and philosophical questions they confronted. The Judeo-Arabic social context in which the poetry emerged; critical issues pertaining to the study and transmission of this literature. Readings from the works of several poets. Readings in translation. Additional readings in Hebrew available. HU TR

LITR 197b / EALL 203b, The Tale of Genji Edward Kamens

A reading of the central work of prose fiction in the Japanese classical tradition in its entirety (in English translation) along with some examples of predecessors, parodies, and adaptations (the latter include Noh plays and twentieth-century short stories). Topics of discussion include narrative form, poetics, gendered authorship and readership, and the processes and premises that have given *The Tale of Genji* its place in "world literature." Attention will also be given to the text's special relationship to visual culture. No knowledge of Japanese required. A previous college-level course in the study of literary texts is recommended but not required. HU

* **LITR 198b / GMAN 333b, Medieval German Lyric** Staff

Introduction to courtly poetry of the German High Middle Ages, from the twelfth through thirteenth centuries. Focus on the woman's voice as a performance device in the lyric of major artists. The language and formal conventions of lyric subgenres; development of the woman's role in the lyric of other European cultures. Readings and discussion in English; texts available in the original Middle High German. HU

European Literature since 1800

LITR 215b / GMAN 311b, The Age of Goethe Staff

Introduction to Germany's "classical" period, from the 1790s to the 1830s, with attention to literature, philosophy, art, and culture. The close connection between literature and philosophy of the period; the theoretical foundations of European Romanticism and of later backlashes against it. Some attention to twentieth-century theory. WR, HU

* **LITR 218a / GMAN 226a, Faust** 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 Johnson, Goethe, Wilde, Bulgakov, and Thomas Mann. Screenings of films with a Faustian theme. HU

* **LITR 226a / GMAN 240a, German Modernism** Henry Sussman

Introduction to the radical innovations of modernism as it was forged, received, and revised in German-speaking Europe from c. 1880 to 1945. Literary experiments in dissonance and multifaceted suggestion; strategies in criticism and elucidation demanded by modernist works. Some attention to parallels in painting and music. Readings in English translation. Priority to German Studies majors. HU RP

* **LITR 229b / GMAN 327b, Around Kafka** Henry Sussman

Franz Kafka's writings viewed as a site for the radical questioning and dislocation of Western systems, institutions, and mores of the early twentieth century. Attention to the shorter fiction, the novels, the letters, and their strategic interrelations; examination of the fields of knowledge, ideological presumptions, and aesthetic and cultural experiments that Kafka touched, and to some degree deranged, with his writing. HU

* **LITR 239a / CLCV 216a / 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 TR

LITR 245b / RSEE 254b / RUSS 254b, Novels of Tolstoy and Dostoevsky Vladimir Alexandrov

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 248a / GMAN 326a, Franz Kafka and Thomas Mann** Jan Hagens

Comparison of Kafka's radical modernism and Mann's neoclassical realism as fundamentally different modes of responding to the challenges of twentieth-century culture. Close reading of short stories by both writers, with attention to the authors' themes, literary techniques, and worldviews. Discussion in English; readings in German or English. HU TR

Non-European Literature since 1800

* **LITR 250b / AFAM 287b / AFST 412b / FREN 412b, Postcolonial Theory and Literature** Christopher Miller

A survey of the principal modes of thought that have animated decolonization and life after colonialism, as seen in both theoretical and literary texts. Concentration on the British and French imperial and postcolonial contexts. Readings in negritude, orientalism, psychoanalysis, poststructuralism, and novels. Lectures in English; readings available both in French and in English translation. HU RP

* **LITR 252b / PORT 350b, 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 260a / PORT 385a, Brazilian Literature in the New Republic** K. David Jackson

Changing narratives, themes, styles, and aesthetic ideals in current Brazilian prose and poetry. The writers' attempts to express or define a personal, national, and global consciousness influenced by the return of political democracy to Brazil. Focus on readings published within the last five years. Readings and discussion in English; texts available in Portuguese. WR, HU TR

* **LITR 291a / PORT 410a, The Brazilian Short Story in Translation** K. David Jackson

The Brazilian short story from Machado de Assis to the present, confronting the European literary background with Brazilian linguistic, indigenous, and cultural realities. Authors from four literary periods, including Guimarães Rosa and Clarice Lispector, and dominant critical and thematic currents. Conducted in English. WR, HU TR

LITR 292b / LAST 396b / PORT 396b, Modern Brazilian Literature in Translation

K. David Jackson

Study of major writers, movements, and works in Brazilian literature, including drama, poetry, essay, manifesto, memoir, and fiction. Introduction to canonical writers, works, and movements, including naturalism, realism, modernism, social realism, innovative writing, and postmodern trends. General introduction to key concepts in Brazilian civilization. Conducted in English. WR, HU TR

Literary Theory and Special Topics

* **LITR 307b / GMAN 374b, Walter Benjamin and the Modernization of Nineteenth-Century Paris** Henry Sussman

The radical modernization of Paris under the Second Empire (1851–70) as seen through the eyes of Walter Benjamin. Focus on Benjamin's *Arcades Project*, a compendium that charted developments such as Parisian mass transit and streamlined traffic, the construction of apartment houses, and the dissemination of mass media. Readings from other literary texts on the same events include works by Balzac, Zola, and Aragon. HU

* **LITR 323a / ENGL 336a / THST 303a, The Opera Libretto** J. D. McClatchy

A selective survey of the genre from its seventeenth-century Italian origins to the present day. The libretto's history, from *opera seria* to *opéra comique* to melodrama, featuring libretti by Hofmannsthal, W. S. Gilbert, and Auden. Emphasis on literary adaptations, from Da Ponte and Beaumarchais to Britten and Thomas Mann. Source material includes works by Shakespeare, Schiller, Hugo, Melville, and Tennessee Williams. Readings in English; musical background not required. WR, HU

* **LITR 344b / GMAN 345b, Fiction and Knowledge** Carol Jacobs

Fiction and related prose pieces in which the relationships between narration, fiction, understanding, and knowing play a critical role. Focus on works by Western writers of the nineteenth through the twenty-first century. The texts' theoretical implications and implicit self-definitions; the import of concepts such as truth, fiction, self-consciousness, perception, science, and narrative. Readings and discussion in English; texts available in the original German or French. HU TR

- * **LITR 347a / MGRK 234a, Surveillance, Paranoia, and the Modern State** George Syrimis

Cultural and artistic reactions to the collection and control of information and the tension that arises between these practices and liberal claims to privacy rights. Focus on literary and cinematic works. The control of information as manifested in the technologies of behaviorism; the political and economic regimes of totalitarianism; liberal democracy and corporate capitalism; theoretical speculation about the relationship between writers and authors and spectators and their objects. HU

- * **LITR 348b / ENGL 456b / HUMS 427b / JDST 316b, 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 354a / FILM 312a, Theory of Media** Francesco Casetti

Introduction to key issues in media studies. Relationships between commodity, artwork, and networks of exchange; media and public sphere; the analysis of radio and television; alternative or counter-hegemonic conceptions of media; and the viability of the concept "media" itself. HU

- * **LITR 359b / FILM 457b / ITAL 303b, Italian Film from Postwar to Postmodern** Millicent Marcus

A study of important Italian films from World War II to the present. Consideration of works that typify major directors and trends. Topics include neorealism, self-reflexivity and metacinema, fascism and war, and postmodernism. Films by Fellini, Antonioni, Rossellini, De Sica, Visconti, Pasolini, Bertolucci, Wertmuller, Tornatore, and Moretti. Most films in Italian with English subtitles. WR, HU

- * **LITR 366a / FILM 416a / FREN 394a, 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 382b / FILM 419b, German New Waves in Cold War Europe** Katie Trumpener

Comparative study of New Wave cinema in East and West Germany, with a focus on aesthetic ferment, institutional barriers, and transformation. Berlin as the best place to follow Europe's emerging cinematic New Waves before 1961. Distinctive approaches developed by young filmmakers in East and West Germany to political and documentary filmmaking, to the Nazi past and the Cold War, and to class, gender, and social transformation. Knowledge of German helpful but not necessary. WR, HU

- * **LITR 398a / ENGL 308a / FILM 242a / HUMS 454a, Interpreting Film Masterpieces** Dudley Andrew and David Bromwich

Exploration of seven auteurs from Europe and Hollywood, 1937–1967. Assessment of methods that deepen appreciation of the films and the medium. WR, HU

Core Seminars

Two seminars are required for Literature majors; nonmajors may be admitted with permission of the instructor.

* **LITR 416a / GMAN 358a / JDST 345a, Georg Lukács: Literature and Politics**
Hannan Hever

Literary-critical, aesthetic, political, and theoretical writings of Georg Lukács. Lukács as a Jewish thinker and Marxist critic; the development of his thought against the backdrop of twentieth-century history; his influence and reception in Germany, Israel, Austria, the United States, and the Soviet Union. HU

* **LITR 418a / JDST 339a / MMES 418a / RLST 203a, Introduction to Modern Hebrew Literature** Hannan Hever

Overview of the poetics, culture, history, and political dynamics of modern Hebrew literature over the last 250 years. Readings in translation. HU

* **LITR 420b / SPAN 393b, The Jungle Books** Roberto González Echevarría
A study of novels, stories, and films about a journey to the jungle in search of personal fulfillment and the origins of history. Authors include Alvar Núñez Cabeza de Vaca, Arthur Conan Doyle, Joseph Conrad, André Malraux, Alejo Carpentier, W. H. Hudson, Claude Lévi-Strauss, José Eustasio Rivera, and Mario Vargas Llosa. Readings and discussion in English. WR, HU TR

* **LITR 423a / GMAN 276a, Satire, Irony, and Parody** Paul North

The uses and abuses of satire, irony, and parody as literary modes for social critique. Examination of the historical claim that antiquity uses satire, the romantic period uses irony, and the modernist period to the present uses parody for the purposes of critique. Readings include German and Austrian literature written from the eighteenth to the twenty-first centuries and classic works in the ancient Greek, Roman, English, Spanish, and American traditions. HU

* **LITR 427b / FILM 358b / GMAN 369b, Text and Image: The Double of Interpretation** Rüdiger Campe and Florian Fuchs

The textuality of vision and the visuality of text in the interpretation of artifacts in Western culture. The pairing of text and vision traced in literary and theoretical readings and in examples from visual art and film. Conditions, variations, and consequences of this unique media configuration and the politics of its interpretation. Case studies range from Plato to Hobbes, Kleist to Flaubert, and baroque emblems to computer diagrams. HU

* **LITR 429b / GMAN 364b, Illegitimacy** Kirk Wetters

Theoretical exploration of legitimacy as a fundamental historical, legal, and political concept; works by Weber, Schmitt, Blumenberg, and Luhmann. Literary readings on illegitimacy in the specific sense "born out of wedlock"; authors include Shakespeare, Goethe, Kleist, Dostoevsky, and Gide. Discussion in English; readings in German or English. HU, SO

* **LITR 430a / GMAN 416a, Novels of the Institution** Rüdiger Campe

Close reading of novels of institutions—school, law court, administration, hospital—from c. 1900. The shift of focus from the individual to the institution; consequences of this shift for the concept and form of the novel. Works by R. Walser, Joyce, Kafka,

Musil, and Thomas Mann; readings in social and aesthetic theory by Simmel, Lukács, and Benjamin. Discussion in English; readings in German and English. HU

* **LITR 433b / GMAN 357b / PHIL 225b, Nietzsche and His Readers** Paul North
Reading and discussion of Friedrich Nietzsche's major texts, as well as critiques and interpretations by some of his most influential twentieth-century readers. HU

* **LITR 456a / GMAN 456a, Interpretation and Authority** Carol Jacobs
Close readings of works on problems of authority and interpretation by Sigmund Freud, Roland Barthes, Paul de Man, and Walter Benjamin. Exploration of their writing as a performance that questions simplistic notions of truth. Consideration of the problem of how to interpret texts that unsettle the very nature of interpretation. HU

* **LITR 463a / ENGL 353a, Medieval Celtic Literature** David Gabriel
Major texts of Celtic literature, focusing on works from the birth of vernacular literature in the Middle Ages to the early modern period. Cultural, historical, and literary issues surrounding works in the Irish and Welsh languages; literary culture in Breton, Cornish, Scottish Gaelic, and Manx. Genres include lyric and bardic poetry, heroic and religious narrative, and early Arthurian works. Readings in English translation; no knowledge of Celtic languages assumed. HU TR

* **LITR 465b, Travel and Quests in Early World Literature** David Gabriel
Journeys of all types – Viking voyage of discovery, saintly pilgrimage, Zen journey to enlightenment, knightly quest – that speak to the core of the human experience. Literature of travel, journeys, and quests in the ancient and medieval world; focus on the motivation behind travel and on the repercussions of translating such journeys into literary form. HU

* **LITR 468a / GMAN 362a, The Question of Form** Carol Jacobs
The concept of art in relation to form and deformation. The Platonic tradition in *The Republic* and echoed in twentieth-century philosophy (Cassirer and Heidegger), modern literature (Keats, Hardy, Kleist, Poe, Kafka), and film (Godard, Egoyan, Dreyer, Sun Zhou, Wong Kar Wai). HU

* **LITR 480a, Topics in Literary Theory: Psychoanalysis in Literature and Film**
Maira Fradinger
In-depth examination of a field of literary theory; topics change annually, and the course can be taken more than once. The topic for 2015 is concepts in psychoanalytic theory that bridge the clinical world, literary and critical theory, and film and gender studies. Foundational works by Freud and Lacan are considered together with literary and theoretical texts in order to explore the link between the arts and psychoanalytic theory. Concepts from the clinical field that have been imported into theories of culture, society, and the arts. HU

* **LITR 488a or b, Directed Reading and/or Individual Research** Staff
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 or b, The Senior Essay David Gabriel

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 4 (for LITR 491a) or January 15 (for LITR 491b), a three-page prospectus signed by the student's adviser; (2) by October 16 (for LITR 491a) or March 4 (for LITR 491b), a full rough draft (not notes); (3) by December 4 (for LITR 491a) or April 8 (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 493b, The Yearlong Senior Essay David Gabriel

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 4, a three-page prospectus signed by the student's adviser; (2) by January 15, a full rough draft (not notes); (3) by April 8, 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** (p. 129).

Director of undergraduate studies: Andrew Casson, 216 LOM, 432-7056,
andrew.casson@yale.edu; math.yale.edu

FACULTY OF THE DEPARTMENT OF MATHEMATICS

Professors Andrew Casson, Ronald Coifman, Igor Frenkel, Alexander Goncharov, Roger Howe, Peter Jones, Mikhail Kapranov, Gregory Margulis, Yair Minsky, Vincent Moncrief, Hee Oh, David Pollard, Vladimir Rokhlin, Peter Schultheiss (*Emeritus*), Van Vu, Gregg Zuckerman

Associate Professor Sam Payne

J. W. Gibbs Assistant Professors Asher Auel, Xiuyuan Cheng, Asaf Ferber, Steven Frankel, José González, Michael Magee, You Qi, Manas Rachh, Ilia Smilga, Stefan Steinerberger, Sam Taylor, Giulio Tiozzo, Guy Wolf

Adjunct Professors Michael Frame, Gil Kalai, Alex Lubotzky

Lecturers Marketa Havlickova, Miriam Logan, James Rolf

Helmsley Postdoctoral Teaching Scholars Lake Bookman, Brett Smith

Statistics Faculty Andrew Barron, Joseph Chang, John Hartigan (*Emeritus*), David Pollard

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.

Placement in courses 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 Web site (<http://math.yale.edu/undergrad/placement-exam>). 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.

B.A. and B.S. degree programs The prerequisite for each program is calculus through the level of MATH 120 or the equivalent.

Each program normally consists of ten term courses in Mathematics numbered 222 or higher, including MATH 480. These ten may include no more than five term courses from other institutions. Each student is expected to take vector calculus and linear algebra: either MATH 230 and 231, or one of MATH 222 or 225 and 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. 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. 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.

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. degree. Such courses require the approval of the director of undergraduate studies; written approval is advised.

Any student interested in pursuing further study in pure mathematics should include MATH 301, 305, 310, 350, 370, and 430 in his or her program, 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.

Senior requirement During the senior year students majoring in Mathematics normally take the senior seminar (MATH 480). Alternatively, with the consent of the director of undergraduate studies, 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 director of undergraduate studies early in the fall term.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

Courses related to mathematics Each Mathematics major is urged to acquire additional familiarity with the uses of mathematics by taking courses in Applied Mathematics (p. 129), Computer Science (p. 210), Engineering and Applied Science (p. 276), Economics (p. 249), Philosophy (p. 544), Physics (p. 551), Statistics (p. 639), 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 director of undergraduate studies.

Each year the Mathematics and Statistics 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 directors of undergraduate studies whose permission, with that of the relevant director of graduate studies, is required for admission.

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.

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) satisfactory performance on a general oral examination.

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 director of undergraduate studies 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 "Simultaneous Award of

the Bachelor's and Master's Degrees" in Section K, Special Arrangements (p. 65), 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 courses in physical sciences

Specific courses required MATH 230 and 231; or MATH 222 or 225, and MATH 250

Distribution of courses *B.A.* – 2 courses in each of 3 categories chosen from analysis, algebra and number theory, stat and applied math, geometry and topology, logic and foundations; courses from 2 of 3 core areas, as specified; *B.S.* – same, with 2 addtl advanced courses in physical sciences approved by DUS

Substitution permitted With DUS permission, certain courses in Applied Math, Comp Sci, Engineering & Applied Science, Econ, Phil, Physics, Stat

Intensive major Courses in all 3 core areas; 2 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

[MATH 101, Geometry of Nature]

* **MATH 107a, Mathematics in the Real World** Staff

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 Miriam Logan

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. Does not count toward the requirements of a major in Mathematics. 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. 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 116b, Mathematical Models in the Biosciences I: Calculus Techniques**

Michael Frame

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 160b / AMTH 160b, The Structure of Networks** Staff

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 190a or b, Fractal Geometry Michael Frame

A visual introduction to the geometry of fractals and the dynamics of chaos, accessible to students not majoring in science. Study of mathematical patterns repeating on many levels and expressions of these patterns in nature, art, music, and literature. QR

*** MATH 199a, Mathematical Problem Solving** Staff

Study of a variety of techniques for solving challenging mathematical problems. Topics include the pigeon-hole principle, probabilities, congruences, generating functions, polynomials, and basic number theory. Open to students with beginning, intermediate, or advanced problem-solving skills. ½ Course cr

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: Algebra/Number Theory

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: Algebra/Number Theory

Psychology: AdvSci NeuroTrk

[MATH 228, From Euclid to Einstein]

*** MATH 230a, Vector Calculus and Linear Algebra I** Giulio Tiozzo

A careful study of the calculus of functions of several variables, combined with linear algebra. QR

Math: Algebra/Number Theory

*** MATH 231b, Vector Calculus and Linear Algebra II** Giulio Tiozzo

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: Analysis

*** MATH 235b, Reflection Groups** Asher Auel

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: Algebra/Number Theory

MATH 241a / STAT 241a, Probability Theory Staff

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: Stat/Applied Math

MATH 242b / STAT 242b, Theory of Statistics Staff

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 STAT 241 and concurrently with or after MATH 222 or 225, or equivalents. QR

Math: Stat/Applied Math

MATH 244a / AMTH 244a, Discrete Mathematics Asaf Ferber

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: Algebra/Number Theory

Math: Stat/Applied Math

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: Analysis

Math: Stat/Applied Math

MATH 247b / AMTH 247b / G&G 247b, Partial Differential Equations Stefan Steinerberger

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

Math: Stat/Applied Math

MATH 250a, Vector Analysis Andrew Casson

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: Analysis

MATH 251b / STAT 251b, Stochastic Processes Staff

Introduction to the study of random processes, including Markov chains, Markov random fields, martingales, random walks, Brownian motion, and diffusions. Techniques in probability, such as coupling and large deviations. Applications chosen from image reconstruction, Bayesian statistics, finance, probabilistic analysis of algorithms, and genetics and evolution. After STAT 241 or equivalent. QR

Math: Stat/Applied Math

MATH 260a / AMTH 260a, Basic Analysis in Function Spaces Stefan Steinerberger

Diagonalization of linear operators, with applications in physics and engineering; calculus of variations; data analysis. MATH 260 is a natural continuation of PHYS 301. Prerequisites: MATH 120, and 222 or 225. QR

Math: Stat/Applied Math

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: Logic/Foundations

MATH 290a, Fractal Geometry: Concepts and Applications Hee Oh

An examination of mathematical patterns repeating on many levels. Mathematical concepts of fractals and chaos, and application of these tools to modeling natural phenomena. Prerequisites: MATH 120 and 222 or equivalent. QR

Math: Geometry/Topology

MATH 300b, Topics in Analysis Ronald Coifman

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: Core Real Analysis

Math: Analysis

*** 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: Core Real Analysis

Math: Analysis

MATH 305b, Real Analysis Yair Minsky

The Lebesgue integral, Fourier series, applications to differential equations. After MATH 301 or with permission of instructor. QR

Math: Analysis

Math: Core Real Analysis

MATH 310a, Introduction to Complex Analysis Gregory Margulis

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: Stat/Applied Math

Math: Core Complex Analysis

Math: Analysis

*** MATH 315b, Intermediate Complex Analysis** Giulio Tiozzo

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: Analysis

Math: Core Complex Analysis

*** MATH 320a, Measure Theory and Integration** Staff

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: Analysis

Math: Core Real Analysis

*** MATH 325b, Introduction to Functional Analysis** Staff

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: Analysis

Math: Core Real Analysis

MATH 330b / STAT 330b, Advanced Probability Staff

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: Stat/Applied Math

*** MATH 345a, Modern Combinatorics** Van Vu

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: Algebra/Number Theory

Math: Stat/Applied Math

MATH 350a, Introduction to Abstract Algebra Asher Auel

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 222 or equivalent. QR

Math: Core Algebra

Math: Algebra/Number Theory

[MATH 353, Introduction to Representation Theory]*** MATH 354b, Number Theory** Staff

Prime numbers; quadratic reciprocity law, Gauss sums; finite fields, equations over finite fields; zeta functions. After MATH 350. QR

Math: Algebra/Number Theory

MATH 360a, Introduction to Lie Groups Staff

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 231 or 250 or equivalent. MATH 300 or 301 and MATH 350 recommended. QR

Math: Algebra/Number Theory

Math: Geometry/Topology

MATH 370b, Fields and Galois Theory Marketa Havlickova

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: Core Algebra

Math: Algebra/Number Theory

MATH 373a, Algebraic Number Theory Alexander Goncharov

Structure of fields of algebraic numbers (solutions of polynomial equations with integer coefficients) and their rings of integers; prime decomposition of ideals and finiteness of the ideal class group; completions and ramification; adèles and ideles; zeta functions.

Prerequisites: MATH 310 and 370. QR

Math: Algebra/Number Theory

MATH 380a, Modern Algebra I Samuel Payne

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: Algebra/Number Theory

Math: Core Algebra

MATH 381b, Modern Algebra II You Qi

Topics in commutative algebra: general extension of fields; Noetherian, local, and Dedekind rings. Introduction to valuation theory. Rudiments of algebraic geometry.

After MATH 380. QR RP

Math: Core Algebra

Math: Algebra/Number Theory

MATH 420a, Introduction to Ergodic Theory Gregory Margulis

An introduction to ergodic theory. Recurrence, including Poincaré recurrence theorem; ergodicity and ergodic theorems, including the mean ergodic theorem and the individual ergodic theorem; measure preserving transformations with discrete spectrum; mixing and weak mixing; entropy; topological dynamics and topological entropy; applications to combinatorial number theory; homogeneous dynamics with applications to number theory. Prerequisite: MATH 305. QR

MATH 430b, Introduction to Algebraic Topology Andrew Casson

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: Geometry/Topology

[**MATH 435, Differential Geometry**]

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 Andrew Casson

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 201a or b, Introduction to Computer Science Stephen Slade

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

Math: Stat/Applied Math

CPSC 365b, Design and Analysis of Algorithms Daniel Spielman

Paradigms for problem solving: divide and conquer, recursion, greedy algorithms, dynamic programming, randomized and probabilistic algorithms. Techniques for analyzing the efficiency of algorithms and designing efficient algorithms and data structures. Algorithms for graph theoretic problems, network flows, and numerical linear algebra. Provides algorithmic background essential to further study of computer science. After CPSC 202 and 223. QR

Math: Stat/Applied Math

CPSC 440b, Numerical Computation Vladimir Rokhlin

Algorithms for numerical problems in the physical, biological, and social sciences: solution of linear and nonlinear systems of equations, interpolation and approximation of functions, numerical differentiation and integration, optimization. After CPSC 112 or an equivalent introductory programming course; MATH 120; and MATH 222 or 225 or CPSC 202. QR

Math: Stat/Applied Math

PHIL 267a, 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

Math: Logic/Foundations

* **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

Math: Logic/Foundations

Mathematics and Philosophy

Directors of undergraduate studies: Andrew Casson (Mathematics), 216 LOM, 432-7056, andrew.casson@yale.edu; Kenneth Winkler (Philosophy), 406A C, 432-1679, kenneth.winkler@yale.edu

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.

The prerequisite for the major is MATH 120. The major requires twelve term courses including the prerequisite, at least four of which must be in Mathematics at the 200 level or higher and five of which 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.

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 in Philosophy.

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)

Distribution of courses At least 4 courses in Math at 200 level or higher; at least 5 courses in Phil, as specified

Specific courses required MATH 270, PHIL 267, 427

Senior requirement Senior sem

Mathematics and Physics

Adviser for the major: Vincent Moncrief, 64 SPL, 432-6930,
vincent.moncrief@yale.edu

The major in Mathematics and Physics allows students to explore the productive interaction between the two subjects more extensively than either individual major. 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. 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 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, M203 ML, 432-4258, corey.ohern@yale.edu; seas.yale.edu/departments/mechanical-engineering-and-materials-science

FACULTY OF THE DEPARTMENT OF MECHANICAL ENGINEERING AND MATERIALS SCIENCE

Professors Charles Ahn, Ira Bernstein (*Emeritus*), Juan Fernández de la Mora, Alessandro Gomez, † Shun-Ichiro Karato, Marshall Long, Brian Scassellati, Jan Schroers, Udo Schwarz (*Chair*), Mitchell Smooke

Associate Professors Aaron Dollar, Eric Dufresne, † Sohrab Ismail-Beigi, Corey O'Hern, Nicholas Ouellette

Assistant Professors Eric Brown, Judy Cha, Madhusudhan Venkadesan

Lecturers Beth Anne Bennett, Kailasnath Purushothaman, Joseph Zinter

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

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 design, data acquisition, control, and manufacturing), the interfacing of MEMS and actuators via microprocessors to measure and control (e.g., in flow control, robot control, and optimization of automobile performance), and the advent of new materials (composite, shape-memory alloy, ceramic, superconducting) for new applications (e.g., prosthetic devices, biomaterials, stealth aircraft). 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 be constantly aware both of the finiteness of Earth's resources and its environment and of the burden that engineering works place 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 methods of analytical, experimental, and 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; to instill in students an understanding of their professional and ethical responsibilities, which affect society and their profession.

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 freshman year.

A student's undergraduate engineering program usually culminates in one or more special project courses (MENG 471, 472), in which the student pursues a particular 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, preferably no later than the beginning of the sophomore year.

Credit/D/Fail For the Class of 2017 and subsequent classes, no courses taken Credit/D/Fail may be counted toward the Mechanical Engineering major, including prerequisites.

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.

The prerequisites in mathematics are MATH 112, 115, and ENAS 151, or the equivalent. The basic science prerequisites are PHYS 200, 201, or 180, 181; one laboratory from PHYS 165L or 205L, and one from PHYS 166L or 206L, or equivalents.

Nineteen term courses beyond the prerequisites are required as follows:

1. Advanced mathematics: ENAS 194 and MATH 222 or 225
2. Mechanical engineering and related: MENG 211, 280, 285, 286L, 361, 363L, 383, 389, 390, 471 or 472 (the senior requirement), 489, ENAS 130, EENG 200, and at least one lecture course in chemistry numbered CHEM 161 or higher (or CHEM 112 or higher; or a score of 4 or higher on the Advanced Placement test in Chemistry).
3. Technical electives: Three approved technical electives chosen in consultation with the director of undergraduate studies.

The curriculum in this program is arranged in prescribed patterns, but some departures from it are possible with approval of the director of undergraduate studies.

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. The major requires twelve approved term courses in engineering, which can cover a broad array of topics within the subject provided that they contribute to a coherent program. Students should consult with the director of undergraduate studies at the beginning of their sophomore year.

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.

The program requires twelve approved term courses beyond the prerequisites, including the senior project.

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, 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 prerequisites in mathematics are MATH 112 and 115. The basic science prerequisite is physics at least to the level of PHYS 170, 171.

The program requires eight approved term courses beyond the prerequisites, including the senior project.

Senior requirement In all B.S. and B.A. degree programs, students must successfully complete a project (MENG 471 or 472) during their senior year.

Courses for majors in the humanities and social sciences Mechanics and mechanical engineering content can be found in several courses intended for those not majoring in science. See under Engineering and Applied Science (p. 276).

REQUIREMENTS OF THE MAJOR MECHANICAL ENGINEERING, B.S.

Prerequisites MATH 112, 115, and ENAS 151, or equivalent; PHYS 200, 201, or 180, 181, and 2 labs (1 from PHYS 165L or 205L, and 1 from PHYS 166L or 206L, or equivalents)

Number of courses 19 term courses beyond prereqs (incl senior project)

Specific courses required ENAS 130 and 194; EENG 200; MATH 222 or 225; MENG 211, 280, 285, 286L, 361, 363L, 383, 389, 390, 489

Distribution of courses 3 technical electives chosen in consultation with DUS; 1 term course in chem

Substitution permitted With DUS approval

Senior requirement Senior project (MENG 471 or 472)

ENGINEERING SCIENCES (MECHANICAL), B.S. AND B.A.

Prerequisites *B.S.* – 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); *B.A.* – MATH 112, 115; PHYS 170, 171

Number of courses *B.S.* – 12 term courses beyond prereqs (incl senior project); *B.A.* – 8 term courses beyond prereqs (incl senior project)

Substitution permitted With DUS approval

Senior requirement *Both degrees* – senior project (MENG 471 or 472)

Courses

* **MENG 185b, Mechanical Design** Aaron Dollar

A course designed for potential majors in mechanical engineering, with units on design, materials science, structural mechanics, utilization of a machine shop, mechanical dissection, and computers in mechanical engineering. Includes a design project competition. Prerequisite: physics at the level of PHYS 180, or permission of instructor.

SC RP

MENG 211a, Thermodynamics for Mechanical Engineers Alessandro Gomez
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 Kailasnath Purushothaman

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 Udo Schwarz

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 286Lb, Solid Mechanics and Materials Science Laboratory Jan Schroers

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 361a, Mechanical Engineering II: Fluid Mechanics Mitchell Smooke

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 383a, Mechanical Engineering III: Dynamics Corey O'Hern

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

Kailasnath Purushothaman

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, Computer-Aided Engineering Marshall Long

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 403a, Introduction to Nanomaterials and Nanotechnology Jeeyoung Cha
Survey of nanomaterial synthesis methods and current nanotechnologies. Approaches to synthesizing nanomaterials; characterization techniques; device applications that involve nanoscale effects. Prerequisite: MENG 285 or permission of instructor. SC

MENG 404a / BENG 404a, Medical Device Design and Innovation Joseph Zinter
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 440a / ENAS 440a, Applied Numerical Methods I Beth Anne Bennett
The derivation, analysis, and implementation of various numerical methods. Topics include root-finding methods, numerical solution of systems of linear and nonlinear equations, eigenvalue/eigenvector approximation, polynomial-based interpolation, and numerical integration. Additional topics such as computational cost, error analysis, and convergence are studied in several contexts throughout the course. Prerequisites: MATH 115, and 222 or 225, or equivalents; ENAS 130 or some experience with Matlab, C++, or Fortran programming. QR RP

MENG 441b / ENAS 441b, Applied Numerical Methods II 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 RP

MENG 463a, Theoretical Fluid Dynamics Juan Fernández de la Mora
Derivation of the equations of fluid motion from basic principles. Potential theory, viscous flow, flow with vorticity. Topics in hydrodynamics, gas dynamics, stability, and turbulence. Prerequisite: MENG 361 or equivalent. QR, SC RP

* **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** Corey O'Hern
Faculty-supervised individual or small-group projects with emphasis on research (laboratory or theory), engineering design (required for the ABET-accredited program), or tutorial study. Students are expected to consult the director of undergraduate studies and appropriate faculty members to discuss ideas and

suggestions for topics. These courses may be taken at any time during the student's career when appropriate and may be taken more than once. Permission of adviser and director of undergraduate studies required.

MENG 489a, Mechanical Design: Process and Implementation Aaron Dollar
Study of the design process, including concept generation, project management, teamwork, detail design, and communication skills. Student teams implement a real-world design project with hardware objectives that can be achieved in a term, and a problem definition that allows room for creative solutions. Prerequisite: MENG 280, 361, or permission of instructor. SC RP

* **MENG 491b, Appropriate Technology and the Developing World** Joseph Zinter
Introduction to user-centered design through exploration of appropriate technology, a class of solutions that solve a particular need and are viable and sustainable within the environmental, economic, cultural, and technological infrastructure for which they are intended. Focus on technologies for use in the developing world. Student design teams conceptualize, ideate, prototype, and generate a commercialization plan for a real-world appropriate technological device. RP

Media Theory and History

Coordinator: Francesco Casetti, 53 Wall St., 432-0671, francesco.casetti@yale.edu

FACULTY ASSOCIATED WITH MEDIA THEORY AND HISTORY

Professors Dudley Andrew (*Film & Media Studies, Literature*), Jack Balkin (*Law School*), Jessica Brantley (*English*), Rüdiger Campe (*German*), Francesco Casetti (*Humanities, Film & Media Studies*), Aaron Gerow (*Film & Media Studies, East Asian Languages & Literatures*), Inderpal Grewal (*Women's, Gender, & Sexuality Studies*), Matthew Jacobson (*History, American Studies, African American Studies*), David Scott Kastan (*English*), Marianne LaFrance (*Psychology, Women's, Gender, & Sexuality Studies*), John MacKay (*Slavic Languages & Literatures, Film & Media Studies*), Charles Musser (*American Studies, Film & Media Studies, Theater Studies*), Robert Post (*Law School*), Henry Sussman (*German*) (*Visiting*), Katie Trumpener (*Literature, English*), Michael Warner (*English, American Studies*), Laura Wexler (*American Studies, Women's, Gender, & Sexuality Studies*)

Associate Professors Gundula Kreuzer (*Music*), Karen Nakamura (*Anthropology, East Asian Studies*), R. John Williams (*English*)

Assistant Professor J. D. Connor (*History of Art*)

Media Theory and History examines the category of "media" as both an object and a method of study. This field of study considers media as historically constituted entities, as objects of theoretical and juridical debate, and as crucial elements of the messages they convey and the audiences they help to constitute. Media Theory and History bridges diverse disciplinary approaches, including literature, film, legal studies, history of art, sociology, anthropology, architecture, history of science, and computer science. It considers the social contexts and cultural effects of different media, including oral communication, written and printed texts, recorded and broadcast sound and image, and digital media.

Yale College does not have a department or a major in media studies. Media Theory and History serves as a network connecting faculty members whose interests in research and teaching intersect around the subject of media. The faculty members listed above have made themselves available to advise students interested in approaching media from various disciplinary perspectives. Advisers help students identify appropriate sequences and combinations of courses, and meet with students about senior essays on interdisciplinary topics in media studies.

Modern Middle East Studies

Directors of undergraduate studies: Sarab Al Ani, B-57 HGS, 432-5757, sarab.alani@yale.edu; Narges Erami, Rm. 336, 10 Sachem St., 436-4204, narges.erami@yale.edu; www.yale.edu/macmillan/cmcs

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*), Dimitri Gutas (*Near Eastern Languages & Civilizations*), Christine Hayes (*Religious Studies*), Hannan Hever (*Comparative Literature*), Marcia Inhorn (*Anthropology*), Anthony Kronman (*Law School*), Bentley Layton (*Religious Studies*), Joseph Manning (*Classics, History*), Ivan Marcus (*History*), Alan Mikhail (*History*), Robert Nelson (*History of Art*), W. Michael Reisman (*Law School*), Maurice Samuels (*French*), Lamin Sanneh (*Divinity School*), Harvey Weiss (*Near Eastern Languages & Civilizations*)

Associate Professors Zareena Grewal (*American Studies*), Kaveh Khoshnood (*Public Health*), Andrew March (*Political Science*), A. Mushfiq Mobarak (*School of Management*), Kishwar Rizvi (*History of Art*), Eliyahu Stern (*Religious Studies*)

Assistant Professors Rosie Bsheer (*History*), Thomas Connolly (*French*), Robyn Creswell (*Comparative Literature*), Narges Erami (*Anthropology*), Adria Lawrence (*Political Science*), Mark Lazenby (*School of Nursing*), Julia Stephens (*History*), Jonathan Wyrzten (*Sociology*)

Senior Lecturers Geetanjali Singh Chanda (*Women's, Gender, & Sexuality Studies*), Tolga Koker (*Economics*), Kathryn Slanski (*Near Eastern Languages & Civilizations*)

Lecturers Adel Allouche (*History*), Karla Britton (*Architecture*), Karen Foster (*History of Art*), Saghar Sadeghian (*Council on Middle East Studies*), Eric van Lit (*Council on Middle East Studies*)

Senior Lecturer II Ayala Dvoretzky

Senior Lectors Sarab Al Ani, Muhammad Aziz, Jonas Elbousty, Shiri Goren, Dina Roginsky, Farkhondeh Shayesteh

Lector Etem Erol

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, using any of its four major languages, Arabic, Hebrew, Persian, and Turkish. Courses are

selected from the Department of Near Eastern Languages and Civilizations and from other departments in the humanities and social sciences, including Anthropology, History, History of Art, Judaic Studies, Political Science, and Religious Studies. The Modern Middle East Studies major gives students the language skills necessary to understand complex issues of the Middle East and serves as excellent preparation for graduate study or for business and professional careers in which an understanding of that region is essential.

Prerequisites There are no prerequisites, but prospective majors should keep the language requirement in mind while planning their course schedules (see below).

Requirements of the major Twelve term courses are required for the major, including three foundational courses, one each in modern thought, classical thought, and the modern Middle East. Six electives on the modern Middle East examine culture and thought, history, religion, politics, and society. Elective courses must be spread geographically and substantively; they must focus on at least two different subregions and originate in at least two different departments. The proposed course of study requires the approval of the director of undergraduate studies.

Language requirement All students are required to complete two courses at the L5 level in a Middle Eastern language. The two courses may be applied toward the twelve-course major requirement. Typical courses include ARBC 150, 151, and PERS 150.

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. The student selects a faculty adviser with competence in an appropriate language. A prospectus and outline signed by the adviser must be submitted to the director of undergraduate studies 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 additional information. Alternatively, 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 3 foundational courses, 1 each in modern thought, classical thought, and the modern Middle East; 6 electives spread geographically and substantively, focusing on at least 2 subregions and from at least 2 depts

Language requirement 2 courses at L5 level in a Middle Eastern lang

Senior requirement Senior essay (MMES 491 or MMES 492, 493) or essay written in an addtl sem

Foundational Courses

MODERN THOUGHT

* **MMES 216a / HEBR 156a / JDST 405a, Dynamics of Israeli Culture** Shiri Goren
Controversies in Israeli society as revealed in novels, films, poetry, newspaper articles, Web sites, art, advertisements, and television shows. Themes include migration and the construction of the Sabra character; ethnicity and race; the emergence of the Mizrahi

voice; women in Israeli society; private and collective memory; the minority discourse of the Druze and Russian Jews; and Israeli masculinity and queer culture. Conducted in Hebrew. Papers may be written in English or Hebrew. Prerequisite: HEBR 140 or permission of instructor. L5, HU RP

CLASSICAL THOUGHT

MMES 192a / RLST 170a, The Religion of Islam Gerhard Böwering
The rise of Islam in Arabia; Muhammad and the Qur'an; Muslim tradition and religious law; crucial issues of Islamic philosophy and theology; basic beliefs and practices of the Muslim community; Sufism and Shi'ism; religious institutions and modern trends; fundamentalism and violence; freedom and democracy. HU

THE MODERN MIDDLE EAST

MMES 102a / NELC 102a, Introduction to the Middle East Benjamin Foster
Introduction to the history and cultures of the Middle East from the rise of Islam to the present, including the Arab world, Iran, Turkey, and Israel. Emphasis on factors important for understanding the Middle East today. HU

* **MMES 181b / AFST 389b / GBLB 186b / PLSC 389b, Middle East Exceptionalism**
Adria Lawrence

The Middle East and North Africa in comparative perspective. Evaluation of claims that the region's states are exceptionally violent, authoritarian, or religious. Themes include gender, Islam, nation and state formation, oil wealth, terrorism, and war. SO

Elective Courses

* **MMES 111a / ANTH 360a, Representing Iran** Narges Erami
Major themes in Iranian history and culture used as a critical framework for understanding challenges that face Iran today. Examination of Western production of knowledge about Iran. Topics include local and oral history, revolutions, Islam and secularism, democracy and theocracy, and the role of cinema. SO

MMES 149a / ER&M 219a / HIST 219a / JDST 200a / RLST 148a, Jewish History and Thought to Early Modern Times Ivan Marcus

A broad introduction to the history of the Jews from biblical beginnings until the European Reformation and the Ottoman Empire. Focus on the formative period of classical rabbinic Judaism and on the symbiotic relationships among Jews, Christians, and Muslims. Jewish society and culture in its biblical, rabbinic, and medieval settings. Counts toward either European or non-Western distributional credit within the History major, upon application to the director of undergraduate studies. HU RP

MMES 156b / HEBR 161b / JDST 407b, Israeli Popular Music Dina Roginsky
Changes in the development of popular music in Israel explored as representations of changing Israeli society and culture. The interaction of music and cultural identity; modern popular music and social conventions; songs of commemoration and heroism; popular representation of the Holocaust; Mizrahi and Arab music; feminism, sexuality, and gender; class and musical consumption; criticism, protest, and globalization. Conducted in Hebrew. Prerequisite: HEBR 140 or equivalent. L5

* **MMES 157b / JDST 306b / NELC 157b, Israeli Narratives** Shiri Goren
Close reading of major Israeli novels in translation with attention to how their themes and forms relate to the Israeli condition. Theories of war and peace, migration,

nationalism, and gender. Authors include Yehoshua, Grossman, Matalon, Castel-Bloom, and Kashua. No knowledge of Hebrew required. HU TR

*** MMES 159a / HEBR 159a / JDST 409a, Conversational Hebrew: Israeli Media**
Shiri Goren

An advanced Hebrew course for students interested in practicing and enhancing conversational skills. Focus on listening comprehension and on various forms of discussion, including practical situations, online interactions, and content analysis. Prerequisite: HEBR 140 or permission of instructor. L5 RP

MMES 160a / JDST 323a / NELC 155a, State and Society in Israel Dina Roginsky
The interplay between the state and society in Israel. Current Israeli discourse on controversial issues such as civil rights in a Jewish-democratic state, Jewish-Arab relations, and right and left politics. Issues of orthodoxy, military service, globalization, and multiculturalism in Israel. Sociopolitical changes that have taken place in Israel since the establishment of the state in 1948 and that have led to the reshaping of Israeli Zionist ideology. HU

*** MMES 172b / HIST 384Jb / NELC 403b, The Middle East between Crusaders and Mongols** Adel Allouche

The impact of the Crusades and the Mongol conquests on the Islamic Middle East. Political, social, and economic changes in the region from the eleventh century to the middle of the fourteenth. Emphasis on the rise of new dynasties as a result of changes in the ethnic mosaic of the Middle East. WR, HU

*** MMES 173b / HIST 398Jb / NELC 404b, Mamluk Egypt** Adel Allouche

A study of the Mamluks, manumitted slaves initially imported to Egypt for military service who established their own rule over Egypt and Syria (1250–1517). Focus on the structure and workings of the Mamluk state. Military, political, economic, and social factors that contributed to the grandeur and, later, the decline of the Mamluk period in Egypt and its conquest by the Ottoman Turks. WR, HU

MMES 175a / HIST 350a / NELC 350a, Formation of the Islamic State, 610–750 Adel Allouche

The development of Islamic polity and society from the rise of Islam to the rise of the Abbasid dynasty. Religious and societal changes caused by the success of Muhammad's mission; ramifications of the subsequent Arab expansion at the expense of the Byzantine and Sasanian empires. The origins of Islamic institutions; the historical development of the main religious sects and of Islamic legal thought; Western views of Islam. HU

MMES 193b / RLST 155b, The Golden Age of Islam Gerhard Böwering

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 197a / HIST 216a / JDST 332a / RLST 193a, Zionism Shaun Halper

Introduction to the core ideas of the Zionist movement from the mid-nineteenth century to the mid-twentieth. Focus on internal Jewish debates and criticism of the movement by European and Middle Eastern intellectuals. Social, political, cultural, and

messianic ideological strands within the movement and their interpretations of various historical experiences and ideas located in the Jewish tradition. HU

* **MMES 282b / AFST 373b / GLBL 362b / SOCY 339b, Imperialism, Insurgency, and State Building in the Middle East and North Africa** Jonathan Wyrzten

The historical evolution of political order from Morocco to Central Asia in the past two centuries. Focus on relationships between imperialism, insurgency, and state building. Ottoman, European, and nationalist strategies for state building; modes of local resistance; recent transnational developments; American counterinsurgency and nation-building initiatives in the region. SO

* **MMES 291b / AFST 348b / SOCY 232b, Islamic Social Movements** Jonathan Wyrzten

Social movement and network theory used to analyze the emergence and evolution of Islamic movements from the early twentieth century to the present. Organization, mobilization, and framing of political, nonpolitical, militant, and nonmilitant movements; transnational dimensions of Islamic activism. Case studies include the Muslim Brotherhood, Hamas, Hizbollah, Al-Qaeda, Al-Adl wa-Ihsann, and Tablighi Jama'at. SO

* **MMES 311b / ER&M 327b / WGSS 327b, Constructing the Self: From Autobiography to Facebook** Geetanjali Chanda

Autobiography in its evolving form as literary genre, historical archive, and individual and community narrative in a changing geographical context. Women's life stories from Afghanistan, China, Cambodia, Indonesia, India, Iran, Egypt, Jordan, and Vietnam illustrate the dialectic relationship between the global and the local. What the reading and writing of autobiographies reveal about oneself and one's place in society; autobiography as a horizontal community formation. WR, HU

* **MMES 321b / ANTH 321b / WGSS 321b, Middle East Gender Studies** Marcia Inhorn

The lives of women and men in the contemporary Middle East explored through a series of anthropological studies and documentary films. Competing discourses surrounding gender and politics, and the relation of such discourse to actual practices of everyday life. Feminism, Islamism, activism, and human rights; fertility, family, marriage, and sexuality. SO

MMES 341a / HIST 341a, Political Islam, Past and Present Julia Stephens

A historical introduction to Islamic law and debates in Islamic political thought from the Prophet to the Arab Spring. Different interpretations of Islamic law, the formation of Muslim empires, European colonialism, nationalist movements, jihad, and the role of religion in contemporary politics in the Middle East, South Asia, Southeast Asia, Europe, and the United States. HU

* **MMES 418a / JDST 339a / LITR 418a / RLST 203a, Introduction to Modern Hebrew Literature** Hannan Hever

Overview of the poetics, culture, history, and political dynamics of modern Hebrew literature over the last 250 years. Readings in translation. HU

Directed Study and Senior Essay Courses

* **MMES 471a and MMES 472b, Independent Directed Study** Narges Erami

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** Narges Erami

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 Narges Erami

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: Michael Koelle, CE 28A SHM, 737-5808,
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undergraduate

FACULTY OF THE DEPARTMENT OF MOLECULAR BIOPHYSICS AND BIOCHEMISTRY

Professors † Karen Anderson, Susan Baserga, † Ronald Breaker, † Gary Brudvig, Enrique De La Cruz, † Daniel DiMaio, Donald Engelman, Alan Garen, Mark Gerstein, Mark Hochstrasser, Jonathon Howard, Anthony Koleske, William Konigsberg, † Patrick Loria, † I. George Miller, Andrew Miranker, † Peter Moore (*Emeritus*), Karla Neugebauer, † Thomas Pollard, Lynne Regan, † David Schatz, Robet Schulman (*Emeritus*), Dieter Söll, Mark Solomon, Joan Steitz, Thomas Steitz, Scott Strobel, † William Summers, Patrick Sung, Kenneth Williams (*Adjunct*), † Sandra Wolin

Associate Professors Michael Koelle, A. Elizabeth Rhoades, Yong Xiong

Assistant Professors † Richard Baxter, Julien Berro, Christian Schlieker, Matthew Simon, Chuck Sindelar, † Corey Wilson

Lecturers † Sandy Chang, Aruna Pawashe

† A joint appointment with primary affiliation in another department.

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.

Basic science prerequisites The basic science courses required of all majors include four half-term units of introductory biology (BIOL 101, 102, 103, 104); a general chemistry course with laboratory, (CHEM 161, 165, or CHEM 163, 167, or CHEM 112, 113, or CHEM 114, 115, or CHEM 118; and CHEM 134L, 136L, or CHEM 116L, 117L, or CHEM 119L); a year course in organic chemistry with laboratory, (CHEM 174, 175, or CHEM 124, 125, or CHEM 220 with 221 or 230; and CHEM 222L, 223L); one term of physical chemistry (CHEM 328); two terms of calculus (MATH 112 and 115); and one year of physics (PHYS 170, 171, or PHYS 180, 181, or PHYS 200, 201). The B.A. major also requires one term of biology laboratory (MCDB 221L or E&EB 223L, or MCDB 121L or E&EB 123L). Some of the prerequisites in biology, chemistry, mathematics, and physics 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.

B.S. degree Nine courses are required beyond the prerequisites: MB&B 300, 301, 302, 360L, and 490; two additional upper-level MB&B electives, one of which must be a non-laboratory course; one quantitative reasoning elective (e.g., MATH 120 or above, STAT 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 quantitative reasoning requirement may not be fulfilled by Advanced Placement test scores.

B.A. degree Seven courses are required beyond the prerequisites: 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, STAT 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 quantitative reasoning requirement may not be fulfilled by Advanced Placement test scores.

Senior requirement The senior requirement for both the B.S. and the B.A. is fulfilled by successful completion of MB&B 490, The Senior Project. 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.

Credit/D/Fail Courses taken Credit/D/Fail may not be counted toward the requirements of the major.

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 freshman 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