

Vanderbilt University Graduate School

www.vanderbilt.edu/gradschool



VANDERBILT





Graduate School



Vanderbilt
University
2008/2009

Containing general information
and courses of study
for the 2008/2009 session
corrected to 27 June 2008
Nashville

The university reserves the right, through its established procedures, to modify the requirements for admission and graduation and to change other rules, regulations, and provisions, including those stated in this bulletin and other publications, and to refuse admission to any student, or to require the withdrawal of a student if it is determined to be in the interest of the student or the university. All students, full- or part-time, who are enrolled in Vanderbilt courses are subject to the same policies.

Policies concerning noncurricular matters and concerning withdrawal for medical or emotional reasons can be found in the *Student Handbook*, which is on the Vanderbilt Web site at www.vanderbilt.edu/student_handbook.

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Graduate School Calendar 2008/2009

FALL SEMESTER 2008

Classes begin / Monday 25 August

Last day to submit Intent to Graduate forms for December graduation / Friday 19 September

Homecoming and related activities / Monday 20 October–Saturday 25 October

Fall break / Monday 20 October–Tuesday 21 October

Last day to withdraw from courses without academic penalty / Friday 24 October

Thanksgiving holidays / Saturday 22 November–Sunday 30 November

Final day for submission of theses and dissertations to the Graduate School for graduation in December / Friday 5 December

Reading days and examinations / Wednesday 10 December–Thursday 18 December

Fall semester ends / Thursday 18 December

SPRING SEMESTER 2009

Classes begin / Wednesday 7 January

Last day to submit Intent to Graduate forms for May graduation / Monday 2 February

Spring holidays / Saturday 28 February–Sunday 8 March

Last day to withdraw from courses without academic penalty / Friday 13 March

Founder's Day / Tuesday 17 March

Final day for submission of theses and dissertations to the Graduate School for graduation in May / Monday 30 March

Reading days and examinations / Wednesday 22 April–Thursday 30 April

Commencement / Friday 8 May

SUMMER SEMESTER 2009

Last day to submit Intent to Graduate forms for August graduation / Friday 19 June

Final day for submission of theses and dissertations to the Graduate School for graduation in August / Friday 24 July

Graduate Study at Vanderbilt

GRADUATE education has held a central place in the program of Vanderbilt University since it opened in 1875. The first Doctor of Philosophy degree was granted in 1879; the 2,000th in 1975, the university's centennial year. The 3,000th was given in 1985. As of 2008, more than 5,400 Doctor of Philosophy degrees have been awarded. By way of comparison, the first Ph.D. given by an American university was awarded in 1861, and the second American institution to offer the degree did so in 1870.

A separate Graduate School was established at Vanderbilt in 1935 by action of the Board of Trust, with an official faculty selected from various schools of the university. Selection is based on the individual faculty member's administrative responsibility or substantial participation in graduate instruction.

Vanderbilt offers to able and serious students a faculty that is active in research and deeply committed to the development of scholars. Students participate in classroom, tutorial, and collegial modes of learning and in systematic independent inquiry, in a setting that allows them to see scholars at work, day in and day out, as an important means of learning the scholar's art. Students are in situations in which they are known personally and well, and concern for what happens to them is very strong.

Vanderbilt is a member of the Association of American Universities, a sixty-two-member organization of research-intensive universities. The Doctor of Philosophy especially, but also the Master of Arts and Master of Science, are research degrees, offered by a faculty of research scholars.

The objectives of the Graduate School are to train scholars and to promote research. The faculty seeks to provide every student with thorough knowledge of a particular field and a mastery of the methods of productive scholarship. Wherever feasible, the faculty intends to provide opportunity for all Ph.D. candidates to have supervised teaching experiences.

The Graduate School enrolls about 2,200 students. About 48 percent are women, and 28 percent come from foreign countries.

The University

Comodore Cornelius Vanderbilt, who gave a million dollars to build and endow Vanderbilt University in 1873, expressed the wish that it "contribute . . . to strengthening the ties which should exist between all geographical sections of our common country."

A little more than a hundred years later, the Vanderbilt Board of Trust adopted the following mission statement: "We reaffirm our belief in the unique and special contributions that Vanderbilt can make toward meeting the nation's requirements for scholarly teaching, training, investigation, and service, and we reaffirm our conviction that to fulfill its

inherited responsibilities, Vanderbilt must relentlessly pursue a lasting future and seek highest quality in its educational undertakings.”

Today as Vanderbilt pursues its mission, the university more than fulfills the Commodore’s hope. It is one of a few independent universities with both a quality undergraduate program and a full range of graduate and professional programs. It has a strong faculty of more than 2,800 full-time members and a diverse student body of more than 11,000. Students from many regions, backgrounds, and disciplines come together for multidisciplinary study and research.

The 330-acre campus is about one and one-half miles from the downtown business district of the city of Nashville, combining the advantages of an urban location with a peaceful, parklike setting of broad lawns, shaded paths, and quiet plazas.

The schools of the university offer the following degrees:

Graduate School. Master of Arts, Master of Arts in Teaching, Master of Fine Arts, Master of Liberal Arts and Science, Master of Science, Doctor of Philosophy.

College of Arts and Science. Bachelor of Arts.

Blair School of Music. Bachelor of Music.

Divinity School. Master of Divinity, Master of Theological Studies.

School of Engineering. Bachelor of Engineering, Bachelor of Science, Master of Engineering.

Law School. Master of Laws, Doctor of Jurisprudence.

School of Medicine. Master of Education of the Deaf, Master of Public Health, Master of Science in Clinical Investigation, Master of Science in Laboratory Investigation, Master of Science in Medical Physics, Master of Science (Speech-Language Pathology), Doctor of Audiology, Doctor of Medicine.

School of Nursing. Master of Science in Nursing, Doctor of Nursing Practice.

Owen Graduate School of Management. Master of Accountancy, Master of Business Administration, Master of Science in Finance.

Peabody College. Bachelor of Science, Master of Education, Master of Public Policy, Doctor of Education.

No honorary degrees are conferred.

Accreditation

Vanderbilt University is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools to award bachelor’s, master’s, education specialist’s, and doctor’s degrees. Contact the Commission on Colleges at 1866 Southern Lane, Decatur, Georgia 30033-4097 or call (404) 679-4500 for questions about the accreditation of Vanderbilt University.

Facilities

Vanderbilt has many special facilities for study and research in particular areas, as well as the traditional classroom and laboratory facilities associated with graduate instruction.

Graduate instruction in the humanities, the biological sciences, and the social sciences is conducted in Benson, Buttrick, Calhoun, Furman, Garland, and Wilson halls. Graduate work in religion uses the full facilities of Vanderbilt Divinity School. The E. Bronson Ingram Studio Arts Center, opened in fall 2005, has studios for sculpture, ceramics, photography, computer arts, painting, and drawing. Gallery space is designated for exhibits primarily of students' work.

The Stevenson Center for the Natural Sciences, a complex of seven connected buildings, includes laboratory and lecture facilities for biological sciences, chemistry, geology, mathematics, and physics.

Classrooms and laboratories of Peabody College are used for graduate instruction in education and psychology and human development.

Laboratories for the biomedical sciences—biochemistry, bioinformatics, cancer biology, cell and developmental biology, cellular and molecular pathology, microbiology and immunology, molecular physiology and biophysics, and pharmacology—are in the Vanderbilt Medical Center in Medical Center North, Light Hall, Preston Research Building, Robinson Research Building, and Medical Research Building IV. The A. B. Learned Laboratories and Medical Research Building III provide additional facilities for biological sciences. Graduate students in neuroscience use facilities across campus with a home in the Vanderbilt Brain Institute.

Graduate work in engineering uses the laboratories of the School of Engineering, including those in the Olin Hall of Engineering, Featheringill Hall, Jacobs Hall, as well as the Stevenson Center.

The facilities of Owen Graduate School of Management are used for graduate study in management. Graduate students in nursing science use the facilities of Godchaux and Frist Halls, and those in hearing and speech sciences use classrooms and laboratories in the Vanderbilt Bill Wilkerson Center.

The Jean and Alexander Heard Library

"We often tend to think of a library simply as a collection of books. What we sometimes forget is that a library is a place of interaction, where the minds of students and faculty collide with other minds removed in time and place." —*Chancellor Emeritus Alexander Heard*

The Jean and Alexander Heard Library is one of the important research libraries in the Southeast, with more than 3.3 million volumes in nine libraries. Most materials are shelved in open stacks and are available to students and faculty through Acorn, the library's online catalog, and DiscoverLibrary, the catalog's new interface. The Heard Library Web site also provides access to a growing number of full-text journals, as well as indexes and other research resources, and is accessible remotely via the campus network and from workstations in each library.

The divisions of the Heard Library include:

Annette and Irwin Eskind Biomedical Library

Central Library (contains resources in the social sciences and humanities)

Divinity Library

Alyne Queener Massey Law Library
Walker Management Library
Anne Potter Wilson Music Library
Peabody Library
Sarah Shannon Stevenson Science and Engineering Library
Special Collections and University Archives

For more information about library collections, facilities, and services, see the library's portal, www.library.vanderbilt.edu.

Information Technology Services

Information Technology Services (ITS) offers voice, video, data, computing, and Web conferencing services to Vanderbilt students, faculty, and staff, and provides free anti-spyware and antivirus downloads.

ITS maintains and supports VUnet, the campuswide data network that provides access to the Internet, and VUnet ID, the authentication service that enables Vanderbilt users to securely identify themselves to many services on VUnet. Those services include OASIS, the university's course registration system; Online Access to Knowledge (OAK); VUospace, the university's network file system; and VUmail, the university's e-mail system. VUmail now includes VUmailguard, designed to protect your e-mail from viruses, unwanted mail (spam), and high-risk attachments.

ITS maintains the campus phone (voice) network, including a personal phone line for each resident student. Optional services include voice mail and long-distance calls from campus (V-net). ITS also partners with Sprint, Verizon, and AT&T to offer discounts for cellular phone service.

For campus residents, ITS supports ResNet, which provides a direct connection to VUnet and the Internet. Phone and cable television ports are provided in each campus residence. For more information about ResNet, see digitallife.vanderbilt.edu/resnetstart.html.

Through the Digital Life initiative, Vanderbilt partners with Ruckus, Napster, FreshTracks Music, and Joost to offer VUmix, a legal, safe, inexpensive, and easy way to explore and share music and digital content. See digitallife.vanderbilt.edu and www.vanderbilt.edu/vumix for details.

The ITS Help Desk provides information to students, faculty, and staff about VUnet and VUnet services. Help Desk locations, hours, contacts, and other information can be found at www.vanderbilt.edu/helpdesk.

For more information on IT services, visit its.vanderbilt.edu.

Visit www.vanderbilt.edu/technology.html for more information on computing at Vanderbilt.

The Center for Teaching

The Center for Teaching offers services to the entire Vanderbilt University teaching community, including those who currently teach, those who are just beginning to teach, and those who anticipate that teaching will be a part of their future careers. The services of the center are available to all graduate students, and some programs are designed especially for teaching

assistants (TAs). Below is a description of programs of interest to graduate students.

The *Fall TA Orientation* introduces participants to teaching at Vanderbilt, focusing specifically on the information and skills necessary to begin in the classroom. Workshops and practice teaching sessions are led by experienced graduate student and professional student teaching assistants.

The *Teaching Certificate* program has been designed to help graduate students, professional students, and post-doctoral fellows develop and refine their teaching skills through three cycles of teaching activities, each consisting of inquiry, experimentation, and reflection phases. Participants who complete the program receive a Teaching Certificate from the Graduate School and the Center for Teaching.

The *Graduate Student Teaching Event for Professional Development (GradSTEP)* is an annual conference that features concurrent sessions on teaching topics ranging from learner-centered course design to teaching while dissertating.

The *International Teaching Assistant Program (ITAP)* coordinates programs and services to assist international teaching assistants in the development of skills for teaching in the American classroom.

The *Graduate Teaching Fellows and Teaching Affiliates Program* provides graduate students the opportunity to work at the center, facilitating the programs offered to graduate students, consulting with TAs, and collaborating on teaching-related projects.

For more information, please visit the Center for Teaching Web site at www.vanderbilt.edu/cft or call (615) 322-7290.

Interdisciplinary Centers, Institutes, and Initiatives

Vanderbilt actively promotes research and teaching that crosses disciplines, departments, and institutional lines through a multitude of centers and institutes. Some of these programs receive funding through the Chancellor's Academic Venture Capital Fund, whose purpose is to launch major new interschool or transinstitutional initiatives in promising research fields. Below is a sampling of Vanderbilt's interdisciplinary initiatives. For more information, see www.vanderbilt.edu/researchers.html.

THE CAL TURNER PROGRAM FOR MORAL LEADERSHIP IN THE PROFESSIONS fosters an environment conducive to faculty research and teaching in areas associated with moral leadership, helps students develop the ability to provide moral leadership within their chosen professions and within the broader community, and serves as a resource for professionals. www.vanderbilt.edu/moral_leadership

THE CENTER FOR THE AMERICAS brings together scholars whose research and teaching cross disciplinary, political, and geographical boundaries to investigate the cultural, economic, and political interactions among the countries and territories of the Western Hemisphere and between the region and other parts of the world. The center develops and helps sustain lasting partnerships that solve problems of importance to the Americas and in the process reshapes ways in which the academy conducts research, evaluates research results, and trains future generations of scholars. www.vanderbilt.edu/americas

THE CENTER FOR COMMUNITY STUDIES brings together psychologists, anthropologists, sociologists, and other social scientists with decades of experience in community development, community organizing, and community building. The center works locally, nationally, and internationally with public agencies, private companies, and local community organizations to conduct and apply academic research to improve quality of life in communities. peabody.vanderbilt.edu/ccs

THE CENTER FOR ETHICS fosters critical reflection, wide understanding, and engagement that encourages people with different ways of living and learning to examine their own values as well as those of others and to live constructively and wisely together. The center promotes increased attention to the ethical issues and problems that people face in their everyday and professional lives. The foci of the center's programs are faculty development, curriculum development, research, citizenship, and outreach. www.vanderbilt.edu/CenterforEthics

THE CENTER FOR INTEGRATIVE AND COGNITIVE NEUROSCIENCE supports the quest to comprehend how the brain produces thought and emotion. The purpose of this endeavor is not only to develop more effective treatments for mental and neurological disorders, but also to further our understanding of what it is to be human. CINC researchers focus on three areas: sensory science; development, learning and memory; and clinical neuroscience. cicn.vanderbilt.edu

THE CENTER FOR LATIN AMERICAN STUDIES, established in 1947, works to advance knowledge about and understanding of the region's history, culture, political economy, and social organization. The center administers the Latin American Studies undergraduate and master's programs, as well as a joint Master of Arts and Master of Business Administration program with the Owen Graduate School of Management and a joint degree program in law and Latin American Studies with Vanderbilt Law School. CLAS also fosters a lively research community on campus by sponsoring colloquia, conferences, films, and speakers. sitemason.vanderbilt.edu/clais

THE CENTER FOR MEDICINE, HEALTH, AND SOCIETY explores links between the humanities, social sciences, and academic medicine by cultivating dialogue among research and teaching faculty; by developing innovative curricular programs at the undergraduate and graduate level that examine health and health care in their social and cultural contexts; and by expanding student involvement in research and service. Any interested faculty member or student may affiliate with the center. www.vanderbilt.edu/mhs

THE CENTER FOR THE STUDY OF RELIGION AND CULTURE draws from Vanderbilt's ten schools to advance a well-recognized history of excellence in the study of religion and culture. An intellectual incubator, the center helps develop projects that address the most current social, political, economic, and other issues involving religion and culture through small grants, graduate fellowships, and cosponsorship of lectures, seminars, and conferences. www.vanderbilt.edu/csrrc

THE CURB CENTER FOR ART, ENTERPRISE, AND PUBLIC POLICY is the first university-based policy program to fully explore the sources of cultural policy in the United States. The center examines the complex, decentralized system through which federal legislation, government regulation, and the policies of film studios, record companies, and broadcasters shape America's cultural landscape. www.vanderbilt.edu/curbcenter

THE LEARNING SCIENCES INSTITUTE comprises a group of interdisciplinary scholars studying how we learn, with a special focus on new uses of technology and innovative teaching practices to enhance learning. www.vanderbilt.edu/lsci

THE MAX KADE CENTER FOR EUROPEAN AND GERMAN STUDIES fosters an international perspective on issues relating to Europe and transatlantic relations. It offers an interdisciplinary major and minor along with joint majors in modern European studies (EUS) that are designed to broaden students' appreciation of the European continent, the evolution of a European identity over the centuries, the emergence of the EU, and the way Europe responds to such challenges as migration and integration, energy and sustainability, security, and globalization. Its curriculum is designed to give majors disciplinary breadth as well as expertise in a specialty of their choosing. The MKC seeks to prepare students for international careers or advanced study.

THE ROBERT PENN WARREN CENTER FOR THE HUMANITIES promotes interdisciplinary research and study in the humanities, social sciences, and natural sciences. The center is designed to intensify and increase interdisciplinary discussion of academic, social, and cultural issues and also engages in outreach to the community by sponsoring teacher training, lectures and seminars, and publications designed to promote the importance of the humanities in today's world. www.vanderbilt.edu/rpw_center

THE VANDERBILT BILL WILKERSON CENTER FOR OTOLARYNGOLOGY AND COMMUNICATION SCIENCES is an integrated educational, research, and patient care center dedicated to serving individuals with otolaryngologic and communicative disorders. The center restores health and the ability to communicate to thousands of people every year through patient care, professional education, and clinical research, and encourages interdisciplinary collaboration in all of the speech, language, and hearing sciences and otolaryngology specialties. www.mc.vanderbilt.edu/root/vumc.php?site=aboutbw

THE VANDERBILT BRAIN INSTITUTE promotes and facilitates the discovery efforts of Vanderbilt neuroscientists, the training of undergraduate and graduate students, and the coordination of public outreach in brain sciences. Research endeavors in the VBI include more than three hundred scientists from fifty departments, centers, and institutes across the campus, spanning a spectrum of study from molecules to the mind. Vanderbilt's neuroscience training programs foster the development of trainees to independent research scientists and educators, preparing them for careers in an integrative discipline. The undergraduate neuroscience major is an interdisciplinary program from several departments and schools providing a comprehensive background in biology, chemistry, mathematics, and physics as well as a strong foundation in the fundamentals of neuroscience. braininstitute.vanderbilt.edu

THE VANDERBILT CENTER FOR NASHVILLE STUDIES is a transinstitutional center supporting social scientific and historical research in greater Nashville. VCNS faculty and doctoral student fellows conduct research on a wide range of urban social policy themes, including civil rights, labor, immigration, poverty, education, race-ethnic relations, housing, homelessness, and health. More information on research and funding opportunities, curricular innovation, and community outreach initiatives is available at the VCNS Web site. www.vanderbilt.edu/vcns

THE VANDERBILT CHILD AND FAMILY POLICY CENTER develops, promotes, and implements public policy and community strategies that strengthen children and families through research, advocacy, and education. The center has drawn national attention to issues involving families including communities, health care, and the work place. www.vanderbilt.edu/VIPPS/C&FPC

THE VANDERBILT INSTITUTE FOR INTEGRATIVE BIOSYSTEMS RESEARCH AND EDUCATION unites biological and physical scientists and engineers who have interest in working at the multifaceted interface of biology, chemistry, education, engineering, medicine, and physics. The activities of the institute are directed primarily toward the support and enhancement of education and research, particularly in the areas of cellular instrumentation and control, biomedical imaging, technology-guided therapy, biological applications of

nanosystems, cellular/tissue bioengineering and biotechnology, and bioengineering education technologies. www.vanderbilt.edu/viibre

THE VANDERBILT INSTITUTE FOR PUBLIC POLICY STUDIES addresses a wide range of issues, including health policy, urban social policy and revitalization of low-income inner-city neighborhoods, crime and anti-social behavior, social welfare, and joint U.S.-Japan business and technical cooperation. VIPPS provides opportunities for undergraduate and graduate students to learn about research design, implementation, and data analysis. Students are mentored by senior researchers and participate in all phases of research projects. By participating in research projects, students develop critical thinking skills and learn how to translate research findings into practical policy recommendations. www.vanderbilt.edu/VIPPS

THE VANDERBILT INSTITUTE OF CHEMICAL BIOLOGY provides research and training in the application of chemical approaches to the solution of important biomedical problems. Particular strengths of the institute include analytical methodology and molecular imaging, cellular responses to chemical stress, drug discovery, enzyme and receptor chemistry, proteomics, structural biology, and chemical synthesis. The institute trains graduate students and has a rich assortment of core facilities that provide access to techniques and equipment at the frontiers of biomedical research. www.vanderbilt.edu/vicb

THE VANDERBILT INSTITUTE OF NANOSCALE SCIENCE AND ENGINEERING engages in theoretical and experimental research in science and engineering at the nanoscale (from one millionth to one billionth of a meter in size). VINSE supports an extensive infrastructure of materials fabrication and analytical facilities for research in nanoscale science and engineering, trains graduate students, and provides a point of focus for chemists, physicists, biologists, and engineers at Vanderbilt with research interests in nanoscience. VINSE includes programs in nano-optics; nanofluidics; nanoelectronics; nanoscale instrumentation and characterization; and nanomechanics. vinse.vanderbilt.edu

THE VANDERBILT KENNEDY CENTER FOR RESEARCH ON HUMAN DEVELOPMENT is one of fourteen Eunice Kennedy Shriver Intellectual and Developmental Disabilities Research Centers supported in part by the Eunice Kennedy Shriver National Institute of Child Health and Human Development. It also is a University Center for Excellence in Developmental Disabilities Education, Research, and Service in the national network of sixty-seven such centers in every U.S. state and territory supported by the U.S. Administration on Developmental Disabilities. The mission of the Vanderbilt Kennedy Center is to improve, through research, training, and outreach, the quality of life of persons with disorders of thinking, learning, perception, communication, mood and emotion caused by disruption of typical development. The center is a university-wide institute, with interdisciplinary research programs addressing five broad areas: autism (Treatment and Research Institute for Autism Spectrum Disorders), communication and learning, developmental neurobiology and brain plasticity, emotion and mood, and families. Students have the opportunity to collaborate in research with mentorship from renowned Vanderbilt Kennedy Center scientists in Vanderbilt research training programs in developmental disabilities, developmental psychopathology, neurogenomics, neuroscience, vision science, and special education. Observation, practicum, and clinical experiences are available in the center's clinical programs. kc.vanderbilt.edu

THE VANDERBILT UNIVERSITY INSTITUTE OF IMAGING SCIENCE aims to support and integrate advances in physics, engineering, chemistry, computing, and other basic sciences for the development and application of new and enhanced imaging techniques to address problems and stimulate new research directions in biology and medicine, in health and disease. www.vuivs.vanderbilt.edu

Other initiatives include:Advanced Computing Center for
Research and Education

American Economic Association

Arthritis and Joint Replacement Center

Biomathematics Study Group

Bishop Joseph Johnson Black Cultural
Center

Career Center

Carpenter Program in Religion, Gender,
and Sexuality

Center for Biomedical Ethics and Society

Center for Bone Biology

Center for Child Development

Center for Clinical Toxicology

Center for Community Studies

Center for Constructive Approximation

Center for Entrepreneurship Education

Center for Evaluation and Program
ImprovementCenter for Experiential Learning and
Assessment

Center for Human Genetics Research

Center for Integrative Health

Center for Intelligent Systems

Center for Matrix Biology

Center for Medicine, Health, and Society

Center for Molecular Neuroscience

Center for Noncommutative Geometry
and Operator Algebras

Center for Science Outreach

Center for Space Physiology and
Medicine

Center for Structural Biology

Center for Teaching

Center for Vascular Biology

Center in Molecular Toxicology

Classroom Organization and
Management Program

Clinical Nutrition Research Unit

Clinical Research Center

Clinical Trials Center

Cognitive Robotics Lab

Community Outreach Partnership Center

Comprehensive Care Center

Digestive Disease Research Center

Division of Sponsored Research

eLab (digital commerce research
center)

English Language Center

Executive Development Institute

Family-School Partnership Lab

Financial Markets Research Center

Freedom Forum First Amendment Center
at Vanderbilt University

Geriatric Evaluation Program

Informatics Center

Institute for Global Health

Institute for Medicine and Public Health

Institute for Software Integrated Systems

Institute for Space and Defense
Electronics

Intelligent Robotics Lab

Interdisciplinary Graduate Program in
the Biomedical Sciences (IGP)

IRIS Center for Training Enhancements

Joint Center for Nursing Research

Kelly Miller Smith Institute on Black
Church Studies

Lamb Center for Pediatric Research	Vanderbilt Center for Environmental Management Studies
Laser Diagnostics and Combustion Group	Vanderbilt Center for Stem Cell Biology
Latin American Public Opinion Project	Vanderbilt Diabetes Research and Training Center
Law and Business Program	Vanderbilt Engineering Center for Transportation Operations and Research
Law and Economics Ph.D. Program	Vanderbilt George O'Brien Renal Center
Leadership Development Center	Vanderbilt-Ingram Cancer Center
Living State Physics	Vanderbilt Institute for Public Policy Studies (VIPPS)
Margaret Cuningham Women's Center	Child and Family Policy Center
Mass Spectrometry Research Center	Center for Evaluation Research and Methodology
National Center on Performance Incentives	Center for Health Policy
National Center on School Choice	Center for Psychotherapy Research and Policy
Opportunity Development Center	Center for State and Local Policy
Owen Entrepreneurship Center	Center for U.S.-Japan Studies and Cooperation
Peabody Center for Education Policy	Vanderbilt-Meharry Center for AIDS Research
Principals Leadership Academy of Nashville	Vanderbilt-Northwestern-Texas-Harvard/MIT Engineering Research Center for Bioengineering Educational Technologies
Proteomics and Functional Biology	Vanderbilt Programs for Talented Youth
Cryo-electron Microscopy Facility	Vanderbilt Sleep Disorders Center
Gene Profiling Laboratory	Vanderbilt Sports Medicine Center
Vanderbilt Inst. of Imaging Science	Vanderbilt Transplant Center
Proteomics Laboratory	Vanderbilt Voice Center
Radiation Effects and Reliability Group	Vision Research Center
Skin Diseases Research Core Center	W. M. Keck Free-Electron Laser Center / Biophotonics Program
Susan Gray School for Children	W. T. Bandy Center for Baudelaire and Modern French Studies
Tennessee Lions Eye Center	Zebrafish Program in Functional Genomics
Tennessee Poison Center	
Turner Center for Church Leadership and Congregational Development	
TV News Archive	
Vanderbilt Addiction Center	
Vanderbilt Breast Center	
Vanderbilt Burn Center	
Vanderbilt Center for Better Health	

Life at Vanderbilt

VANDERBILT provides a full complement of auxiliary services to meet the personal needs of students, to make life on the campus comfortable and enjoyable, and to provide the proper setting for academic endeavor.

Graduate Student Council

The Graduate Student Council (GSC) exists to enhance the overall graduate experience at Vanderbilt by promoting the general welfare and concerns of the graduate student body, creating new programs and initiatives to provide opportunities for growth and interaction, and communicating with the Vanderbilt faculty and administration on behalf of graduate students. These goals are accomplished through a structure of elected representatives, standing committees, and officers. Meetings, which are open to all graduate students, are held monthly. Council meetings provide a forum in which to address many types of concerns. In the recent past, the GSC has helped change policies involving the process for approving dissertations, TA advocacy, parking, student health insurance coverage, housing, and the student-funded recreation center. The GSC is also a member of the National Association of Graduate and Professional Students (NAGPS).

In addition to its representative function, the GSC also organizes a number of events and hosts/sponsors various projects during the year. Some examples include co-sponsoring seminars and panels with individual departments, Graduate Student Research Day (early spring semester), the Graduate Student Honor Council, community outreach activities, and social opportunities. The GSC also awards travel grants to graduate students who wish to present their research at conferences throughout the year. All Vanderbilt graduate students are welcome to attend GSC's monthly meetings and to get involved. For more information, visit www.vanderbilt.edu/gsc.

Housing

To support the housing needs of new and continuing graduate and professional students, the Office of Housing and Residential Education provides a Web-based off-campus referral service (apphost1a.its.vanderbilt.edu/housing). The referral service lists information on housing accommodations off campus. The majority of rental property is close to the campus. Cost, furnishings, and conditions vary greatly. For best choices, students seeking off-campus housing should visit the office or consult the Web site by early July for suggestions and guidance. The Web site includes advertisements by landlords looking specifically for Vanderbilt-affiliated tenants, as well as by Vanderbilt students looking for roommates. Listings are searchable by cost, distance from campus, number of bedrooms, and

other parameters. Students may also post “wanted” ads seeking roommate or housemate situations. On-campus university housing for graduate or professional students is not available.

Change of Address

Students who change either their local or permanent mailing address are expected to notify school and university registrars immediately. Candidates for degrees who are not in residence should keep the school and University Registrar informed of current mailing addresses. To change or update addresses, go to registrar.vanderbilt.edu/academicrec/address.htm.

The Commodore Card

The Commodore Card is the Vanderbilt student ID card. It can be used to access debit spending accounts and campus buildings such as residence halls, libraries, academic buildings, and the Student Recreation Center.

ID cards are issued at the Commodore Card Office, 184 Sarratt Student Center, Monday through Friday from 8:30 a.m. to 4:00 p.m. For more information, see the Web site at www.vanderbilt.edu/commodorecard.

Eating on Campus

Vanderbilt Dining operates several food facilities throughout campus that provide a variety of food and services. The two largest dining facilities are Rand Dining Center behind the Sarratt Student Center and The Commons Dining Center on Peabody campus. Six convenience stores on campus offer grab-and-go meals, snacks, beverages, and groceries. All units accept the Commodore Card. For hours and menus, visit the Web site at www.vanderbilt.edu/dining.

Obtaining Information about the University

Notice to current and prospective students: In compliance with applicable state and federal law, the following information about Vanderbilt University is available:

Institutional information about Vanderbilt University, including accreditation, academic programs, faculty, tuition, and other costs, is available in the catalogs of the colleges and schools on the Vanderbilt University Web site at www.vanderbilt.edu/catalogs. A paper copy of the *Undergraduate Catalog* may be obtained by contacting the Office of Undergraduate Admissions, 2305 West End Avenue, Nashville, Tennessee 37203-1727, (800) 288-0432, (615) 322-2561, admissions@vanderbilt.edu. Paper copies of the catalogs for the graduate and professional schools may be available from the individual schools.

Information about financial aid for students at Vanderbilt University, including federal and other forms of financial aid for students, is available from the Office of Student Financial Aid on the Vanderbilt University Web site at www.vanderbilt.edu/financialaid. The Office of Student Financial Aid is located at 2309 West End Avenue, Nashville, Tennessee 37203-1725, (615) 322-3591 or (800) 288-0204.

Information about graduation rates for students at Vanderbilt University is available on the Vanderbilt University Web site at virg.vanderbilt.edu. Select "Factbook," then "Student Profile," then "Retention Rates." Paper copies of information about graduation rates may be obtained by writing the Office of the University Registrar, Vanderbilt University, Peabody #505, 230 Appleton Place, Nashville, Tennessee 37203-5721 or by calling (615) 322-7701.

The annual *Security at Vanderbilt* report on university-wide security and safety, including related policies, procedures, and crime statistics, is available from the Vanderbilt Police Department on the university Web site at police.vanderbilt.edu/secatvu.htm. A paper copy of the report may be obtained by writing the Vanderbilt Police Department, 2800 Vanderbilt Place, Nashville, Tennessee 37212 or by calling (615) 343-9750. For more information, see "Vanderbilt Police Department" in the following section of this catalog.

A copy of the annual *Equity in Athletics Disclosure Act Report* on the Vanderbilt University athletic program participation rates and financial support data may be obtained by writing the Vanderbilt University Office of Athletic Compliance, 2601 Jess Neely Drive, P.O. Box 120158, Nashville, Tennessee 37212 or by calling (615) 322-7992.

Information about your rights with respect to the privacy of your educational records under the Family Educational Rights and Privacy Act is available from the Office of the University Registrar on the Vanderbilt University Web site at www.registrar.vanderbilt.edu/academicrec/privacy.htm. Paper copies of this information about educational records may be obtained by writing the Office of the University Registrar, Vanderbilt University, Peabody #505, 230 Appleton Place, Nashville, Tennessee 37203-5721 or by calling (615) 322-7701. For more information, see "Confidentiality of Student Records" in the following section of this catalog.

Services to Students

Confidentiality of Student Records (Buckley Amendment)

Vanderbilt University is subject to the provisions of federal law known as the Family Educational Rights and Privacy Act (also referred to as the Buckley Amendment or FERPA). This act affords matriculated students certain rights with respect to their educational records. These rights include:

The right to inspect and review their education records within 45 days of the day the university receives a request for access. Students should submit to the University Registrar written requests that identify the record(s) they wish to inspect. The University Registrar will make arrangements for access and notify the student of the time and place where the records may be inspected. If the University Registrar does not maintain the records, the student will be directed to the university official to whom the request should be addressed.

The right to request the amendment of any part of their education records that a student believes is inaccurate or misleading. Students who wish to request an amendment to their educational record should write the university official responsible for the record, clearly

identify the part of the record they want changed, and specify why it is inaccurate or misleading. If the university decides not to amend the record as requested by the student, the student will be notified of the decision and advised of his or her right to a hearing.

The right to consent to disclosures of personally identifiable information contained in the student's education records to third parties, except in situations that FERPA allows disclosure without the student's consent. These exceptions include:

- Disclosure to school officials with legitimate educational interests. A "school official" is a person employed by the university in an administrative, supervisory, academic, research, or support staff position (including university law enforcement personnel and health staff); a person or company with whom the university has contracted; a member of the Board of Trust; or a student serving on an official university committee, such as the Honor Council, Student Conduct Council, or a grievance committee, or assisting another school official in performing his or her tasks. A school official has a legitimate educational interest if the official needs to review an education record in order to fulfill his or her professional responsibility.
- To parents if the student is a dependent for tax purposes.
- To appropriate individuals (e.g., parents/guardians, spouses, housing staff, health care personnel, police, etc.) where disclosure is in connection with a health or safety emergency and knowledge of such information is necessary to protect the health or safety of the student or other individuals.
- Information to a parent or legal guardian of a student regarding the student's violation of any federal, state, or local law, or of any rule or policy of the institution, governing the use or possession of alcohol or a controlled substance if the university has determined that the student has committed a disciplinary violation with respect to the use or possession and the student is under the age of twenty-one at the time of the disclosure to the parent/guardian.

The Buckley Amendment provides the university the ability to designate certain student information as "directory information." Directory information may be made available to any person without the student's consent unless the student gives notice as provided for below. Vanderbilt has designated the following as directory information: the student's name, addresses, telephone number, e-mail address, student ID photos, date and place of birth, major field of study, school, classification, participation in officially recognized activities and sports, weights and heights of members of athletic teams, dates of attendance, degrees and awards received, the most recent previous educational agency or institution attended by the student, and other similar information. Any new entering or currently enrolled student who does not wish disclosure of directory information should notify the University Registrar in writing. No element of directory information as defined above is released for students who request nondisclosure except in situations allowed by law. The request to withhold directory information will remain in effect as long as the student continues to be enrolled, or until the student files a written request with the University Registrar to discontinue the withholding. To continue nondisclosure of directory information after a student ceases to be enrolled, a written request for continuance must be filed with the University Registrar during the student's last term of attendance.

If a student believes the university has failed to comply with the Buckley Amendment, he or she may file a complaint using the Student Complaint and Grievance Procedure as outlined in the *Student Handbook*. If dissatisfied with the outcome of this procedure, a student may file a written complaint with the Family Policy and Regulations Office, U.S. Department of Education, Washington, D.C. 20202.

Questions about the application of the provisions of the Family Educational Rights and Privacy Act should be directed to the University Registrar or to the Office of the General Counsel.

Vanderbilt Directory Listings

Individual listings in the online *People Finder Directory* consist of the student's full name, school, academic classification, local phone number, local address, box number, permanent address, and e-mail address. The printed *Vanderbilt Directory* also contains these items unless the student blocks them by September 1 using the update option of the *People Finder Directory*. Student listings in the *People Finder Directory* are available to the Vanderbilt community via logon ID and e-password. Students have the option of making their *People Finder* listings available to the general public (viewable by anyone with access to the Internet), of adding additional contact information such as cellular phone, pager, and fax numbers, and of blocking individual directory items or their listing in its entirety. Students who have placed a directory hold with the University Registrar will not be listed in the online directory. To avoid being listed in the printed directory, the request for a directory hold must be on file prior to September 1.

Directory information should be kept current. Students may report address changes via the Web by going to www.vanderbilt.edu/students.html and selecting the *Address Change* option.

Psychological and Counseling Center

The Psychological and Counseling Center is a broad-based service center available to full-time students, faculty, staff, and their partners and dependents. Services include: 1) family, couples, individual, and group counseling and psychotherapy; 2) psychological and educational assessment; 3) career assessment and counseling; 4) programs such as assertiveness training; marital communication; individual reading and study skills/test-taking techniques; body image, stress, and time management; group support programs for acquiring skills such as relaxation; 5) administration of national testing programs; 6) outreach and consultation; 7) special programming related to diversity issues; 8) campus speakers and educational programs.

Eligible persons may make appointments by visiting the Psychological and Counseling Center or by calling (615) 322-2571. Services are confidential to the extent permitted by law. For more information, see the Web site, www.vanderbilt.edu/pcc. The site also contains self-reflection questions and information resources for counseling services.

Career Center

The Vanderbilt Career Center (VCC) serves graduate students enrolled in master's or Ph.D. programs interested in pursuing opportunities in industry, government, and/or nonprofits. Students pursuing academic employment should contact their faculty advisers or the departments in which they are currently enrolled for career advising and job search assistance. Graduate students who are undecided about their career goals are encouraged to contact the Vanderbilt Psychological and Counseling Center (VPCC) for career assessment and counseling and then be referred to the VCC for appropriate follow-up. For detailed information about the VCC, visit the Web site at www.vanderbilt.edu/career.

Additionally, the VCC partners with the Peabody Career Center, Owen Career Management Center, and the Owen Special Programs Office to support students enrolled in a professional master's program in Peabody College and the MS Finance program in the Owen Graduate School of Management who are pursuing their first full-time professional opportunity. Services to these students include access to the VCC job and internship database, industry career days and networking events, and campus recruiting.

Student Health Center

The Vanderbilt Student Health Center (SHC) in the Zerfoss Building is a student-oriented facility that provides routine and acute medical care similar to services rendered in a private physician's office or HMO.

The following primary care health services are provided to students registered in degree-seeking status without charge and without copayment: visits to staff physicians and nurse practitioners; personal and confidential counseling by mental health professionals; routine procedures; educational information and speakers for campus groups; and specialty clinics held at the SHC.

These SHC primary care services are designed to complement the student's own insurance policy, HMO, MCO, etc., coverage to provide comprehensive care. Students are billed for any services provided outside the SHC or by the Vanderbilt University Medical Center.

The entire medical staff is composed of physicians and nurse practitioners who have chosen student health as a primary interest and responsibility.

The Zerfoss Student Health Center is open from 8:00 a.m. to 4:30 p.m., Monday through Friday, and 8:30 a.m. until noon on Saturday, except during scheduled breaks and summer. Students should call ahead to schedule appointments, (615) 322-2427. A student with an urgent problem will be given an appointment that same day or "worked in" if no appointment is available. When the Student Health Center is closed, students needing acute medical care may go to the Emergency Department of Vanderbilt University Hospital. They will be charged by the VU Medical Center for Emergency Department services.

Students may also call (615) 322-2427 for twenty-four-hour emergency phone consultation, which is available seven days a week (except during summer and scheduled academic breaks). On-call Student Health professionals take calls after regular hours. Calls between 11:00 p.m. and 7:00 a.m. are handled by the Vanderbilt University Emergency Department triage

staff. More information is available on the Web (www.vanderbilt.edu/student_health).

Student Injury and Sickness Insurance Plan

All degree-seeking students registered for 4 or more credit hours or actively enrolled in research courses that are designated by Vanderbilt University as full-time enrollment are required to have adequate health insurance coverage. The university offers a sickness and injury insurance plan that is designed to provide hospital, surgical, and major medical benefits. A brochure explaining the limits, exclusions, and benefits of insurance coverage is available to students online at www.gallagherkoster.com, in the Office of Student Accounts, or at the Student Health Center.

The annual premium is in addition to tuition and is automatically billed to the student's account (one half of the premium billed August 1 and one half billed December 1) if an online insurance waiver form is not completed by the August 1 deadline. Coverage extends from August 12 through August 11 of the following year.

IMPORTANT: If you withdraw or leave the university at any time or for any reason after enrolling in the Vanderbilt insurance plan, you will remain covered through August 11, 2009, and will still be responsible for payment of the premium for the full twelve months of coverage. If you do not complete the online waiver by August 1, 2008, you will be automatically enrolled for a twelve-month policy, and you will be responsible for the insurance premium, which you must pay in two equal installments (in August and January).

Newly enrolled students for the spring term must complete the online waiver process by January 5. The online waiver process indicating comparable coverage **must be completed every year** in order to waive participation in the Student Injury and Sickness Insurance Plan.

Family Coverage. Students who want to obtain coverage for their families (spouse, children, or domestic partner) may secure application forms by contacting the on-campus Student Insurance representative, (615) 343-4688. Dependents can also be enrolled online at www.gallagherkoster.com using a credit card. Additional premiums are charged for family health insurance coverage.

International Student Coverage

International students and their dependents residing in the United States are required to purchase the university's international student health and accident insurance plan. If you have other comparable insurance and do not wish to participate in the Student Injury and Sickness Insurance Plan offered through the university, you must complete an online waiver form (www.gallagherkoster.com) indicating your other insurance information. This online waiver form must be completed no later than September 7 or you will remain enrolled in the plan offered by the university and will be responsible for paying the insurance premium. This insurance is required for part-time as well as full-time students. Information and application forms are provided through the Student Health Center.

Vanderbilt Child and Family Center

The Vanderbilt Child and Family Center supports the health and productivity of the Vanderbilt community by providing resource and referral services, quality child care, and early childhood education to the children of faculty, staff, and students. The center's Web site at www.vanderbilt.edu/HRS/wellness/cfctr.html provides information on resources for child care, adult care, summer programs (both day camps and overnight camps), tutoring services (including test preparation and skill building), and before and after care.

The Child Care Center serves children from six weeks to five years of age and offers placement through a waiting list. Applications may be downloaded from the Web site.

Services for Students with Disabilities

Vanderbilt is committed to the provisions of the Rehabilitation Act of 1973 and Americans with Disabilities Act as it strives to be an inclusive community for students with disabilities. Students seeking accommodations for any type of disability are encouraged to contact the Opportunity Development Center. Services include, but are not limited to, extended time for testing, assistance with locating sign language interpreters, audiotaped textbooks, physical adaptations, notetakers, and reading services. Accommodations are tailored to meet the needs of each student with a documented disability. The Opportunity Development Center also serves as a resource regarding complaints of unlawful discrimination as defined by state and federal laws.

Specific concerns pertaining to services for people with disabilities or any disability issue should be directed to the Disability Program Director, Opportunity Development Center, VU Station B #351809, 2301 Vanderbilt Place, Nashville, Tennessee 37235-1809; phone (615) 322-4705 (V/TDD); fax (615) 343-0671; www.vanderbilt.edu/odc.

Vanderbilt Police Department

The Vanderbilt Police Department, (615) 322-2745, is a professional law enforcement agency dedicated to the protection and security of Vanderbilt University and its diverse community.

The Police Department comes under the charge of the Office of the Vice Chancellor for Administration. As one of Tennessee's larger law enforcement agencies, the Police Department provides comprehensive law enforcement and security services to all components of Vanderbilt University including the academic campus, Vanderbilt Medical Center, and a variety of university-owned facilities throughout the Davidson County area. Non-commissioned and commissioned officers staff the department. Commissioned officers are empowered to make arrests as "Special Police Officers," through the authority of the Chief of Police of the Metropolitan Government of Nashville and Davidson County. Vanderbilt officers with Special Police Commissions have the same authority as that of a municipal law enforcement officer while on property owned by Vanderbilt, on adjacent public streets and sidewalks, and in nearby neighborhoods.

The Police Department includes a staff of more than one hundred people. All of Vanderbilt's commissioned officers have completed officer training at a state-certified police academy. Those officers hold Special Police Commissions and are required to attend annual in-service, as well as on-the-job training. The department also employs non-academy-trained officers for security-related functions.

The Police Department provides several services and programs to members of the Vanderbilt community:

Vandy Vans—The Vanderbilt Police Department administers the Vandy Vans escort system at Vanderbilt University. The Vandy Vans escort system provides vehicular escorts to designated locations on campus. The service consists of vans that operate from 5:00 p.m. to 5:00 a.m.

Stop locations were chosen based on location, the accessibility of a secure waiting area, and student input. Signs, freestanding or located on existing structures, identify each stop. A walking escort can be requested to walk a student from his/her stop to the final destination. A van is also accessible to students with mobility impairments. Additional information about Vandy Vans and specific stop locations can be found at police.vanderbilt.edu/services.htm or by calling (615) 322-2558.

As a supplement to the Vandy Vans van service, walking escorts are available for students walking to and from any location on campus during nighttime hours. Walking escorts are provided by VPD officers. The telephone number to call for a walking escort is 421-8888 (off campus) or 1-8888 (on campus).

Emergency Phones—Emergency telephones (Blue Light Phones) are located throughout the university campus and medical center.

Each phone has an emergency button that when pressed automatically dials the VPD Communications Center. An open line on any emergency phone will activate a priority response from an officer. An officer will be sent to check on the user of the phone, even if nothing is communicated to the dispatcher. Cooperation is essential to help us maintain the integrity of the emergency phone system. These phones should be used *only* for actual or perceived emergency situations.

An emergency response can also be received by dialing 911 from any campus phone. Cell phone users can use (615) 421-1911 to elicit an emergency response on campus. Cell phone users should dial 911 for off-campus emergencies. All callers should be prepared to state their location.

Crime Alerts—Crime Alerts are distributed throughout Vanderbilt to make community members aware of significant unsolved crimes that occur at the university. They are distributed by mail, through Vanderbilt e-mail lists, and through the department's Web page, police.vanderbilt.edu.

Educational and Assistance Programs—The Community Relations Division of Vanderbilt Police Department offers programs addressing issues such as sexual assault, domestic violence, workplace violence, personal safety, RAD (Rape Aggression Defense) classes, and victim assistance.

For further information on available programs and services, call (615) 322-2558 or e-mail crimeprevention.atwood@vanderbilt.edu. Additional information on security measures and crime statistics for Vanderbilt is available

from the Police Department, 2800 Vanderbilt Place, Nashville, Tennessee 37212. Information is also available at police.vanderbilt.edu.

Campus Security Report

In compliance with the Jeanne Clery Disclosure of Campus Security Policy and Campus Crime Statistics Act and the Tennessee College and University Security Information Act, Vanderbilt University will provide you, upon request, an annual Security Report on university-wide security and safety, including related policies, procedures, and crime statistics. A copy of this report may be obtained by writing or calling the Vanderbilt Police Department, 2800 Vanderbilt Place, Nashville, Tennessee 37212 or by telephone at (615) 343-9750. You may also obtain this report on the Web site at police.vanderbilt.edu/secatou.htm.

Parking and Vehicle Registration

Parking space on campus is limited. Motor vehicles operated on campus **at any time** by students, faculty, or staff must be registered with the Office of Traffic and Parking located in the Wesley Place garage. A fee is charged. Parking regulations are published annually and are strictly enforced. More information is available at www.vanderbilt.edu/traffic_parking.

Bicycles must be registered with the Vanderbilt Police Department.

Graduate Student Professional and Personal Development Collaborative

The Graduate Student Professional and Personal Development Collaborative (GSPPD Collaborative) is an informal network of faculty, administrators, and students at Vanderbilt University that seeks to facilitate the awareness and use of the many programs that can help students become productive and well-rounded scholars. The collaborative's Web site (www.vanderbilt.edu/gradschool/gspdd) provides links to various offices and groups at Vanderbilt that support graduate student development. These offices and organizations also jointly sponsor a number of seminars, workshops, and similar events that support student development.

Bishop Joseph Johnson Black Cultural Center

The Bishop Joseph Johnson Black Cultural Center (BJJBCC) represents one of Vanderbilt University's numerous efforts at acknowledging and promoting diversity. It does so by providing educational and cultural programming on the black experience for the entire Vanderbilt community. Dedicated in 1984, the center is named for the first African American student admitted to Vanderbilt University in 1953, Bishop Joseph Johnson (B.D. '54, Ph.D. '58).

One of the center's aims is to provide cultural programming. It sponsors lectures, musical performances, art exhibitions, films, and discussions on African and African American history and culture. The center also provides an office space for a scholarly journal, the *Afro-Hispanic Review*, edited by Vanderbilt faculty and graduate students.

Another of the center's aims is student support and development. The center provides meeting spaces for numerous Vanderbilt student groups, including the Black Student Alliance, the Presbyterian Fellowship, the Muslim Student Association, and Vanderbilt Spoken Word. The center works with students on a wide range of campus projects and community service opportunities. The center also serves as an informal haven for students, with plenty of opportunities for fellowship and food.

One additional aim of the center is community outreach and service. To this end, the center reaches out to civic and cultural groups. The BJJBC facilitates tutoring and mentoring activities for young people from the Metro Nashville Public Schools, the YMCA, and other community agencies. VU students serve as tutors and mentors. The center also helps promote student recruitment by hosting various pre-college groups.

The center houses a computer lab, a small library, a seminar room, an auditorium, a student lounge area, and staff offices. The center is open to all Vanderbilt students, faculty, and staff for programs and gatherings.

International Student and Scholar Services

International Student and Scholar Services (ISSS), located in the Student Life Center, fosters the education and development of nonimmigrant students and scholars to enable them to achieve their academic and professional goals and objectives. ISSS provides advice, counseling, and advocacy regarding immigration, cross-cultural, and personal matters. ISSS supports an environment conducive to international education and intercultural awareness via educational, social, and cross-cultural programs.

ISSS provides immigration advising and services, including the processing of immigration paperwork, to more than 1,500 international students and scholars. The office works with admission units, schools, and departments to generate documentation needed to bring nonimmigrant students and scholars to the U.S. Further, ISSS keeps abreast of the regulations pertaining to international students and scholars in accordance with the Department of Homeland Security (Bureau of Citizenship and Immigration Services) and the Department of State. ISSS coordinates biannual orientation programs for students and ongoing orientations for scholars, who arrive throughout the year.

To help promote connection between international students and the greater Nashville community, ISSS coordinates the First Friends program, which matches international students with Americans both on and off campus for friendship and cross-cultural exchange. The weekly World on Wednesday presentations inform, broaden perspectives, and facilitate cross-cultural understanding through discussions led by students, faculty, and staff. International Education Week in the fall and International Awareness Festival in the spring provide the campus with additional opportunities to learn about world cultures and to celebrate diversity. ISSS provides a range of programs and activities throughout the year to address a variety of international student needs and interests. These programs include Vanderbilt International Volunteers, an International Stress Fest,

and a selection of holiday parties. Additionally, ISSS staff have been instrumental in developing and implementing the Tennessee Conference for International Leadership which brings together international and study abroad students from across the state for workshops and activities.

Margaret Cuninggim Women's Center

The Margaret Cuninggim Women's Center was established in 1978 to provide support for women at Vanderbilt as well as resources about women, gender, and feminism for the university community. In 1987, the center was named in memory of Margaret Cuninggim, dean of women and later dean of student services at Vanderbilt.

Programs for students, faculty, and staff are scheduled throughout the fall and spring semesters and are publicized on the Web at www.vanderbilt.edu/WomensCenter and in the monthly newsletter *Women's VU*, which is distributed without charge to campus addresses on request. Vanderbilt Feminists, a student group that works closely with the women's center, is open to all interested students, both male and female.

The center houses a small library with a collection of books, journals, tapes, and DVDs. Books and tapes circulate for four weeks. Copy facilities are available. The women's center is also home to Project Safe (PS), a coordinated program of education about, prevention of, and response to violence against women on campus.

GLBT Resource Office

The Vanderbilt Gay, Lesbian, Bisexual, and Transgender Resource Office serves the entire Vanderbilt community through education, research, programming, counseling, and social events. Visitors are invited to use the office's resource library for research around GLBT issues. The GLBT Resource Office continually seeks to expand its resources and strives to ensure that Vanderbilt University has the most current information concerning GLBT life, gender and sexual diversity, inclusiveness, and social justice. For more information, visit www.vanderbilt.edu/glb, e-mail glbtooffice@vanderbilt.edu, or phone (615) 322-3330.

Schulman Center for Jewish Life

The 10,000-square-foot Ben Schulman Center for Jewish Life is the home of Vanderbilt Hillel. The goal of the center is to provide a welcoming community for Jewish students at Vanderbilt and to further religious learning, cultural awareness, and social engagement. Vanderbilt Hillel is committed to enriching lives and enhancing Jewish identity. It provides a home away from home, where Jews of all denominations come together, united by a shared purpose. The Schulman Center is also home to Grin's Cafe, Nashville's only kosher and vegetarian restaurant. For further information about the Schulman Center, please call (615) 322-8376 or e-mail hillel@vanderbilt.edu.

Religious Life

The Office of Religious Life (www.vanderbilt.edu/religiouslife) exists to provide occasions for religious reflection and avenues for service, worship, and action. There are many opportunities to clarify one's values, examine personal faith, and develop a sense of social responsibility.

The Holocaust and Martin Luther King Jr. lecture series, as well as Project Dialogue, provide lectures and programs investigating moral issues, political problems, and religious questions.

Baptist, Episcopal, Jewish, Muslim, Presbyterian, Reformed University Fellowship, Catholic, and United Methodist chaplains work with individuals and student groups. Provisions for worship are made for other student religious groups. Counseling and crisis referrals are also available.

Extracurricular Activities

Sarratt Student Center

The Sarratt Student Center (www.vanderbilt.edu/sarratt), named for former mathematics professor and dean of students Madison Sarratt, provides a variety of facilities, programs, and activities. The center houses a cinema, an art gallery, art studios and darkrooms for classes and individual projects, work and office spaces for student organizations, comfortable reading and study lounges fully wired for Internet access, large and small meeting rooms, and large, open commons and courtyard areas for receptions or informal gathering. The center also houses The Pub at Overcup Oak restaurant and Stonehenge Cafe, and leads directly to Rand Dining Center, the Varsity Market, and the Vanderbilt Bookstore. The Vanderbilt Program Board plans concerts, film screenings, classes, speakers, receptions, gallery showings, and many other events throughout the campus. The center's Welcome Desk serves as a campus information center and is a Ticketmaster™ outlet, handling ticket sales for most of the university's and Nashville's cultural events. Sarratt Student Center is home to the Office of the Dean of Students, the Office of Greek Life, the Commodore Card Office, and Vanderbilt Student Communications (including student newspaper, radio station, and yearbook).

Student Life Center

The Vanderbilt Student Life Center (www.vanderbilt.edu/studentlifecenter) is the university's community keystone. It is both the fulfillment of students' vision to have a large social space on campus and a wonderful complement to Sarratt Student Center.

The Student Life Center has more than 18,000 square feet of event and meeting-room space. The 9,000-square-foot Commodore Ballroom is one of the most popular spaces to have events on campus.

The center is also home to Starbucks, the Career Center, International Student and Scholar Services, Health Professions Advisory Office, Office

of Honor Scholarships and ENGAGE, Office of International Services, and Global Education Office.

Recreation and Sports

Graduate and professional students are encouraged to participate in the many physical activity classes, intramurals, and sport clubs offered by the university. All students pay a mandatory recreation fee which supports facilities, fields, and programs (see the chapter on Financial Information). Spouses must also pay a fee to use the facilities.

Physical activity classes offered include racquetball, fly fishing, and scuba, along with rock climbing and kayaking. Forty sport clubs provide opportunity for participation in such favorites as sailing, fencing, rugby, and various martial arts.

The university recreation facilities include gymnasiums, tracks, and four softball diamonds. The four lighted multipurpose playing fields are irrigated and maintained to assure prime field conditions.

The Student Recreation Center houses a 36 meter x 25 yard swimming pool; three courts for basketball, volleyball, and badminton; six racquetball and two squash courts; a weight and fitness room; a wood-floor activity room; a rock-climbing wall; an indoor track; a mat room; locker rooms; and a Wellness Center. Lighted outside basketball and sand volleyball courts and an outdoor recreation facility complement the center.

For additional information, please see the Web site at www.vanderbilt.edu/campusrecreation.

Academic Programs

THE Graduate School accepts candidates for advanced degrees in fifty-four fields. The following table lists degree programs and the degrees available. Please note that many of the programs listed below offering a master's degree do not allow admission for a terminal master's degree. Please check the particular program for further information. A page reference indicates the location in this catalog of the program description and course offerings.

ACADEMIC PROGRAMS	MASTER'S	Ph.D.	Page
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Astronomy	X		259
Biochemistry	X*	X	74
Biological Sciences	X*	X	77
Biomedical Engineering	X	X	82
Biomedical Informatics	X	X	86
Cancer Biology	X*	X	90
Cell and Developmental Biology	X*	X	92
Cellular and Molecular Pathology	X*	X	96
Chemical and Biomolecular Engineering	X	X	98
Chemical and Physical Biology		X	102
Chemistry	X	X	103
Civil Engineering	X	X	108
Classics	X	X	113
Community Research and Action	X	X	119
Computer Science	X	X	122
Creative Writing	X		148
Earth and Environmental Sciences	X		128
Economics	X	X	132
Electrical Engineering	X	X	140
English	X	X	148
Environmental Engineering	X	X	150
French	X	X	155
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Hearing and Speech Sciences		X	164
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Human Genetics		X	177
Interdisciplinary Materials Science	X	X	179
Latin American Studies	X		186
Law and Economics		X	190
Leadership and Policy Studies		X	192
Learning, Teaching, and Diversity	X	X	199
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ACADEMIC PROGRAMS (continued)	MASTER'S	Ph.D.	Page
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Mathematics	X	X	221
Mechanical Engineering	X	X	228
Medicine, Health, and Society	X		232
Microbiology and Immunology	X*	X	235
Molecular Physiology and Biophysics	X*	X	238
Neuroscience	X*	X	242
Nursing Science		X	246
Pharmacology	X*	X	251
Philosophy	X	X	254
Physics	X	X	259
Political Science	X	X	267
Portuguese	X		334
Psychology	X	X	275
Psychology and Human Development	X	X	279
Religion	X	X	284
Sociology	X	X	328
Spanish	X	X	334
Spanish-Portuguese		X	334
Special Education	X*	X	342

* A thesis-based master's degree is awarded only under special circumstances.

Courses of study on the graduate level are offered in a number of areas in which graduate degrees are not offered. Such courses are available as minor work and are described in this catalog's Courses of Study section.

Vanderbilt also offers professional degrees in business administration, divinity, education and human development, engineering, law, management, medicine, nursing, and public policy. Descriptions of these programs may be found in other Vanderbilt catalogs.

Special Programs

Graduate Program in Economic Development

A specialized master's degree program in economics is offered for students from developing countries. The curriculum consists of four core courses in economic theory (macroeconomic and microeconomic), statistics, and econometrics and four electives and a two-semester research seminar. The program offers courses in international trade, project evaluation, and policy analysis; students may also take courses in many other areas of economics, business, finance, and public policy. Field trips are made each year to industries, farms, and communities in the region as well as to the World Bank, International Monetary Fund, and Federal Reserve Board in Washington.

The program is intended primarily for government officials from developing countries and university teachers of economics in those countries. Those who meet the academic requirements of the university also receive the Master of Arts degree in economics. Students with a strong undergraduate background in economics who are proficient in English may be able to complete all M.A. requirements in twelve months, but experience indicates that most participants require at least eighteen months. Students with promising records may continue studying for the Ph.D. in economics, and are eligible for fellowship consideration.

Center for Latin American Studies

The university offers a program of graduate instruction and specialized research that relates the disciplines of the social sciences and humanities to Latin America, with emphasis on Brazil, Colombia, Venezuela, Peru, and Mexico. A joint degree program in which students may earn the M.B.A. and M.A. degrees is available through the Center for Latin American Studies and the Owen Graduate School of Management. For further information, see Latin American Studies in the Courses of Study section.

Master of Fine Arts in Creative Writing

The English department's M.F.A. in creative writing offers writing workshops and supervision in the composition of creative work. Students are required to take a complement of literature courses along with their workshops. The goal of the M.F.A. program is to produce creative writers with a broad and deep knowledge of their genres.

Applicants for the M.F.A. must submit scores in the General Test of the Graduate Record Examination, a college transcript, a manuscript of creative work, a statement of purpose, and three letters of recommendation. For more details see Vanderbilt's M.F.A. Web site: www.vanderbilt.edu/english/mfa.

Requirements for the M.F.A. include 42 to 48 hours of course work, a thesis of creative work (a novel, a book of short stories, a collection of poems, or a collection of personal essays), plus an oral defense of the thesis. The course work includes 16 hours of graduate workshops (one per semester for four semesters). Literature courses might consist of 200-level courses taken for graduate credit, for which 3 hours would be given. M.F.A. students may petition the director of graduate studies in the Department of English for admission to 300-level courses other than English 303, 304, 305, 307, or 370.

Master of Arts in Teaching

The Master of Arts in Teaching (M.A.T.) degree available through the Graduate School is designed specifically for the preparation of secondary school teachers in one or more of the following subjects: chemistry, earth science, English, physics, political science, and sociology. The program is designed for those with a bachelor's degree with no professional education background and who are seeking an initial teaching license.

Requirements for admission are the same as for other degree programs in the Graduate School; candidates for the M.A.T. degree must maintain a *B* average in all major field and teacher education courses. Completion of the degree without initial teacher licensure requires a total of 36 semester hours of acceptable graduate work. At least 18 hours of this total must be completed in a major field for which teacher licensure is offered and at least 9 hours must be in teacher education course work. M.A.T. candidates seeking initial licensure must complete 29 hours of graduate or professional course work in teacher education for a total of at least 47 semester hours toward the degree. Students seeking initial licensure as part of the M.A.T. program must meet specific requirements monitored by the Office of Teacher Licensure to secure licensure recommendation. These students should identify themselves as early as possible in the M.A.T. program so that their credentials can be audited and screened by faculty in Peabody's Department of Teaching and Learning, through which the professional education component is offered to those who qualify. If review of the candidate's qualifications reveals deficiencies, additional requirements may be identified.

Teacher education programs at Vanderbilt are accredited by the Tennessee State Department of Education and the National Council for the Accreditation of Teacher Education (NCATE). Because of these accreditations and other reciprocal agreements, students who complete the licensure program qualify to be licensed in most other states and countries. The Tennessee State Department of Education calculated a composite pass rate of 100 percent for Vanderbilt graduates who completed a teacher education program during the 2002/2003 academic year and who took one or more PRAXIS examination(s) within the Tennessee-defined time period.

Master of Liberal Arts and Science

The Master of Liberal Arts and Science (M.L.A.S.) degree offers part-time adult students the intellectual stimulation of post-baccalaureate course work at a time in their lives when they can contemplate great ideas and enduring questions and measure them against their own life experiences. In discussion with other adult students under the leadership of distinguished faculty members, they are encouraged to look beyond disciplinary boundaries and explore connections that more specialized undergraduate degrees and focused career responsibilities may have obscured. Students often discover important professional and career benefits as well as personal development in earning a Master of Liberal Arts and Science degree. The requirements and curriculum provide flexibility in program design and course selection, and the tuition, scheduling, admission, and registration procedures acknowledge the special circumstances of the part-time adult student.

Courses are taught by tenured Vanderbilt faculty members (and, perhaps, some distinguished emeritus faculty) carefully selected for their recognized abilities as teachers and their special interest in the M.L.A.S. program. Each course meets one evening a week throughout the semester.

Classes are limited in size to encourage optimal student-student and student-faculty interaction.

The Master of Liberal Arts and Science is awarded by the Graduate School and administered by the Dean's Office of the College of Arts and Science. For more information contact the director of the M.L.A.S. program, Martin Rapisarda, Associate Dean, College of Arts and Science, 301 Kirkland Hall, Nashville, Tennessee 37240; (615) 936-5964.

Joint Master of Arts in Latin American Studies and Master of Laws

The joint M.A./LL.M. program will allow law students interested in international law in Latin America to gain the cultural, political, and economic background that they will need to work there. Students entering the program will have to be accepted by both the Law School and the Graduate School. At present, to apply to the LL.M. program, students must **not** be U.S. citizens and must already have a J.D. degree (or its equivalent from their home country). Students successfully completing the program will receive an M.A. in Latin American Studies (following an established non-thesis option) and an LL.M. from the Law School (includes writing a thesis).

Medical Scientist Training Program (M.D./Ph.D.)

A combined course of study leading to the M.D. and Ph.D. degrees is offered through Vanderbilt School of Medicine and Vanderbilt Graduate School. The program facilitates the development of teachers and medical investigators in clinical and basic medical sciences. Six to seven calendar years are usually required for completion of the combined degree program.

All candidates must meet both School of Medicine and Graduate School requirements for matriculation and graduation. Candidates are admitted into the program by the deans of the two schools upon the recommendation of the Medical Scientist Training Program Committee. After their acceptance in the program, students must select and be accepted into the graduate program of an affiliated department. The graduate programs currently affiliated with the Medical Scientist Training Program are biochemistry, biological sciences, biomedical engineering, cancer biology, cell and developmental biology, cellular and molecular pathology, microbiology and immunology, molecular physiology and biophysics, neuroscience, and pharmacology.

M.D./Ph.D. students must pass the qualifying examination for the Ph.D. degree and present an acceptable dissertation within their field of study in the usual manner. Most M.D./Ph.D. students begin full-time study and research for the Ph.D. degree after the second year in medical school and complete the dissertation research before entering the third year of medical study.

Courses in Professional Degree Programs

Students may include in their programs of study certain professional degree courses offered by other schools in the university. They register for these courses through the Graduate School and often do additional work

appropriate for a research degree. Six hours of such credit may be applied to a master's degree program and 12 hours to a Ph.D. program. Students must obtain written approval from their adviser, from the other school, and from the Graduate School. The courses may constitute part of the major or minor field, as approved by the student's adviser.

Individualized Programs

Students with special course goals should inquire in the Graduate School office about the possibility of individualized, interdisciplinary programs of study leading to the master's and Ph.D. degrees. The Graduate School may permit programs that combine several disciplines in unique ways. Financial support for individualized programs must be arranged with specific faculty members as there are no program or departmental financial awards available.

Master's and Ph.D. students may not apply for admission to the individualized program until they have been admitted to and enrolled in a department currently offering that degree. Except under extraordinary circumstances, interested students will be expected to apply, or make preliminary inquiry, to the Graduate School during their first year of graduate studies.

Combined B.A./M.A. (4+1) Program

The College of Arts and Science offers students in most departments and programs the opportunity to earn both the bachelor's degree and the master's degree in a shorter period of time and at less cost than is normally the case. Exceptional students in the College of Arts and Science can obtain both degrees in an expedited period, typically within but not less than five years.

The usual period of study for both the bachelor's and the master's degree is six years. Through the 4+1 option, the student and her or his adviser plan a five-year program of study. It is important to note that there is no provision for obtaining both degrees in a period shorter than five years. The program is intended for selected students for whom the master's degree is sufficient preparation for their career goals, is desirable as a goal in itself, or is viewed as additional preparation before pursuing a doctorate or a professional degree.

The areas of study available for the Combined B.A./M.A. (4+1) option within Arts and Science are determined by individual departments and programs, who also determine the policies and guidelines to be followed. Students will be admitted to the Combined B.A./M.A. program only by the invitation and the approval of the department or program.

Programs of Study

The 4+1 option is currently available in Chemistry; English; French; German; History; Latin American Studies; Mathematics; Medicine, Health, and Society; Philosophy; Political Science; Psychology; and Religious Studies. Students are welcome to discuss the Combined B.A./M.A.

(4+1) option with any of these departments and programs. Other departments and programs are expected to participate in the 4+1 option at a later date.

Admissions Overview

The Integrated B.A./M.A. program allows Vanderbilt University students to study for both degrees often, but not necessarily, in the same department. Undergraduates with strong academic records may apply for admission to the program after the first semester of their junior year. Qualifying students are normally accepted into the program in the second semester of the junior year.

To apply for admission, students will first consult with the appropriate adviser for post-baccalaureate programs, and then submit to the prospective graduate department or program a "Petition to Apply to the Combined B.A./M.A. (4+1) Degree Program" (available at www.vanderbilt.edu/4plus1), a statement of purpose, a formal application to the Graduate School, a preliminary program proposal, two letters of recommendation from Vanderbilt faculty, and a current transcript. Application forms are available for download or can be completed online at www.vanderbilt.edu/gradschool. GRE scores or other admissions requirements may be specified by the prospective department. Admission to the 4+1 option is highly selective. An accomplished academic record, a demonstrated commitment to pursue graduate study, and a strong endorsement from Vanderbilt faculty are key elements to the successful applicant. Students will be provisionally accepted as graduate students, pending completion of all undergraduate requirements. Graduate student status will apply in the fifth year.

Advising

Prospective students should discuss with one of their advisers general information on the program and how this program is appropriate to their long-term goals. All students are encouraged to discuss their plans and goals with their undergraduate pre-major and major adviser. Especially in those cases where the intended graduate program differs from the undergraduate major, the student is further encouraged to seek advice from the advisers in the graduate program, too.

Curriculum

Students in this program must satisfy all requirements for both degrees. Advanced Placement (AP) credits will often be used toward satisfying a comparable number of general curriculum requirements, for a maximum of 18 credit hours. The principal distinction between this program and the standard graduate program is two-fold: (1) students are allowed to take master's courses while completing the bachelor's degree, and (2) students are thereby enabled to complete both degrees within five years.

In order to complete the program in five years, students will be expected to complete most, if not all, of the requirements for their undergraduate degree by the end of the first semester of the senior year. Until all baccalaureate requirements are fulfilled, the student will follow A&S undergraduate

policies and procedures. It is also suggested that students begin taking graduate courses toward the master's degree in the second semester of the senior year. Most graduate programs participating in this option have a non-thesis plan of study requiring 30 graduate credit hours in addition to the requirements for the undergraduate degree. An average load per semester as a graduate student is 9–12 credit hours.

Scholarships and Financial Aid

Students who are receiving scholarships or other forms of financial aid as a Vanderbilt undergraduate are advised that such aid applies in most cases only toward the completion of the bachelor's degree or the first four years of their studies (which may include their taking some graduate courses during their senior year). Students wishing to pursue the 4+1 option should seek support for their fifth year of study through student loans and other financial aid.

For additional information, contact Associate Dean Martin Rapisarda, Kirkland Hall 312, martin.rapisarda@vanderbilt.edu, or consult the Web site at www.vanderbilt.edu/4plus1.

Summer Session

Information concerning the summer session may be found on the Graduate School Web pages at www.vanderbilt.edu/gradschool and at www.vanderbilt.edu/summersessions. A summer session announcement in mid-March of each year will describe procedures, and the course schedule at <https://webapp.mis.vanderbilt.edu/CourseListing/CourseSchedule.action> will list the limited course offerings.

Admission

QUALIFIED applicants with bachelor's degrees are eligible for admission to the Graduate School. Admission is competitive and students are selected on the basis of their scholastic preparation and intellectual capacity.

Generally, minimum requirements for admission are these: an applicant should have completed or soon will complete a course of study equivalent to that required for the bachelor's degree at an accredited institution, maintained a minimum of a *B* average in undergraduate work, and maintained a *B* average in the field of expected graduate concentration. Individual programs in the Graduate School have additional requirements for admission.

Application for admission may be made electronically through the Graduate School Web site (www.vanderbilt.edu/gradschool). Those unable to use our online application should contact the Graduate School for a printable application. There is no application fee for electronic applications.

The deadline by which the completed application for fall admission and all supporting credentials should reach Vanderbilt is January 15. Some programs observe an earlier deadline. Applicants should verify the deadline for the program to which they wish to apply by checking the Web site for that department or program. Typically, admission decisions for fall semester will be mailed by March 31 to all applicants whose files are complete by January 15.

The deadline for responses to offers of financial award is April 15. If your reply is not received by April 15, the department may rescind the offer of financial award.

Most departments do not admit students for the spring semester. Please check with the department in which you are interested before applying for spring semester admission.

Students seeking admission for the spring semester should file applications no later than November 1. Decisions are usually announced before December 1.

Further information regarding the application and admissions process is available at www.vanderbilt.edu/gradschool.

Graduate Record Examination

Submission of scores on the General Test of the Graduate Record Examination (GRE) is required as part of the application to the Graduate School. Some departments also require a report of the score on the Subject Test of the GRE before an application will be considered.

Information concerning the GRE may be obtained from Graduate Record Examinations, Educational Testing Service, Box 6000, Princeton, New Jersey 08541-6000, U.S.A., or the GRE Web site at www.gre.org.

Master of Liberal Arts and Science

Candidates for admission to the M.L.A.S. degree program must present to the Graduate School a formal application, two letters of recommendation, a short essay on "Why this degree? Why now?" and a transcript indicating a completed course of study equivalent to that required for a bachelor's degree at an accredited institution, with a minimum of a *B* average in all undergraduate work (or significant life/work achievement that could compensate for a lower grade point average). Graduate Record Examination scores are not required. After receipt of all materials, the director of the program will interview all prospective students.

International Students

Vanderbilt has a large international community representing approximately one hundred countries. The university welcomes the diversity that international students bring to the campus and encourages academic and social interaction at all levels. International applicants who are offered admission will be contacted by the Vanderbilt Office of International Student and Scholar Services (ISSS) with instructions for initiating the visa process.

English Language Proficiency. Proficiency in written and oral English is required for enrollment in an academic program. Applicants whose native language is not English must present the results of the Test of English as a Foreign Language (TOEFL) with the application, unless they have earned a degree from an American or English-speaking institution. International students transferring from unfinished degree programs of other universities in the United States should present TOEFL scores. The International TOEFL is administered at test centers throughout the world at different times during the year. You may access information regarding the TOEFL exam, including registration and sample tests, at www.toefl.org. Inquiries and requests for application forms should be addressed to TOEFL, Box 6151, Princeton, New Jersey 08541-6151 USA.

The minimum acceptable score on the paper-based total Test of English as a Foreign Language is 570. The computer-based total acceptable score is 230, and for the Internet-based test, 88. Many programs, however, require a considerably higher level of proficiency.

English Instruction. Applicants whose proficiency in English is low or marginal may be asked to enroll in an English language program before beginning academic studies. Vanderbilt offers such a program at its English Language Center (ELC). Intensive, semi-intensive, or part-time English study is offered throughout the year. Noncredit enrollment in at least one academic course may be recommended while the student is improving proficiency in English. Academic studies for credit may begin after recommendation by ELC in consultation with the student's academic adviser. For more information, write to ELC, Vanderbilt University, Peabody #510, 230 Appleton Place, Nashville, Tennessee 37203-5721, USA; www.vanderbilt.edu/ELC.

Financial Resources. To meet requirements for entry into the United States for study, applicants must demonstrate that they have sufficient financial resources to meet expected costs of their educational program. Applicants must provide documentary evidence of their financial resources before visa documents can be issued.

United States laws and regulations restrict the opportunity for international students to be employed. International students may work up to twenty hours per week on campus. Students may be allowed to work off campus only under special circumstances. Many spouses and dependents of international students are not allowed to be employed while in the United States.

Health and Accident Insurance. International students are required to purchase the university's international student health and accident insurance plan. No exceptions are made unless, in the judgment of the university, the student provides proof of coverage that is equal to or greater than that in the university-sponsored policy. Information concerning the limits, exclusions, and benefits of this insurance coverage may be obtained from Student Health Services or from International Student and Scholar Services.

Information. Assistance in nonacademic matters before and during the international student's stay at Vanderbilt is provided by International Student and Scholar Services, Vanderbilt University, Student Life Center, 310 25th Avenue South, Suite 103, Nashville, Tennessee 37240, USA; www.vanderbilt.edu/iss.



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Financial Information

TUITION in the Graduate School for 2008/2009 is charged at the rate of \$1,504 per semester hour with a minimum tuition charge of \$200 per semester.

Tuition and fees are set annually by the Board of Trust and are subject to review and change without further notice.

A minimum of 24 hours is required for master's degrees (most programs require more hours than this minimum). Seventy-two hours of graduate work at the established tuition rate are required for the Ph.D. Transfer students entering Ph.D. programs should note that a minimum of 24 hours of formal course work must be completed in the Vanderbilt Graduate School.

Students who have completed the hours required and who are conducting research full time, register for thesis or dissertation research without hourly credit and are subject to a minimum tuition charge of \$200 per semester.

Master of Liberal Arts and Science Courses

Students in the M.L.A.S. program pay one-half of the regular graduate tuition rate for M.L.A.S. courses and full tuition for courses selected from the regular curriculum. M.L.A.S. course tuition for 2008/2009 is \$2,256 per 3-hour course.

Supplemental Tuition and Continuous Registration

Continuous registration is required of all full-time degree candidates until the required number of course work hours have been completed. Responsibility to maintain registration rests with the student. To retain student status, individuals must register each fall and spring semester or secure an approved leave of absence. A person is in student status *only* if:

- registered, or
- on authorized leave of absence

A student who has completed the formal course work required for the degree may, with approval of the student's department and the Graduate School, conduct full-time thesis or dissertation research away from the university and register for research hours needed for the degree. Tuition is charged at the current rate per semester hour, or \$200 per semester if the student has completed the hours required for the degree.

In general, individuals who have completed the number of hours required for the degree and who are employed full time are not eligible to register as full-time students. Such persons pursuing the Ph.D. degree may register as half-time students if they are devoting a minimum of 20 hours per week to dissertation research and their program offers the half-time research course (3995) for a \$200 per semester fee.

A former student wanting to re-enter the Graduate School must apply for reinstatement, which is granted only on the recommendation of the student's graduate program and with approval of the Graduate School.

Other Fees

Student health insurance	1,958
Student activities and recreation fees	356
Transcript fee (one time only)	30
Late registration	30
Audit fee for regular students (nonrefundable)	10
Ph.D. dissertation publication (microfilming)	60
Thesis or dissertation binding (per copy)	18
Copyright fee for Ph.D. dissertation (optional)	65

Payment of Tuition and Fees

Tuition, fees, and all other university charges incurred prior to or at registration are due and payment must be received by August 20 for the fall semester and January 5 for the spring semester. All charges incurred after classes begin are due and payment must be received in full by the last business day of the month in which they are billed to the student. Visit our Web site at www.vanderbilt.edu/stuaccts for payment options.

Students/Guarantors will be responsible for payment of all costs, including reasonable attorney fees and collection agency fees, incurred by the university in collecting monies owed to the university. The university will assess a \$25.00 fee for any check or e-payment returned by the bank and reserves the right to invoke the laws of the State of Tennessee governing bad checks.

Student Billing Service

Please be aware that paper bills will eventually be eliminated, and the university will be exclusively using the e-billing system. Beginning July 2008 through April 2011 paper invoices will only be mailed for the months of July, August, November, December, and April. Effective July 1, 2011, paper invoices will no longer be generated and mailed. The university will be exclusively using the e-billing system.

E-bill is an online presentation of your Vanderbilt student account invoice and uses a Web-based presentation from Sallie Mae to provide secure access to your billing record. In order to use this service, you must enroll at www.vanderbilt.edu/stuaccts/ebill.html. An e-mail notification will be sent to your Vanderbilt e-mail address with detailed enrollment instructions. Once you have enrolled, you may give additional users (i.e. parent or guardian) access to your invoices.

Vanderbilt University's e-billing program is presented by Sallie Mae and is secure and reliable. The first of each month (except September and January) you and your designated user(s) will receive an e-mail along with the e-billing logon link; therefore, you will have no more delays in receiving

your Student Accounts invoices due to mail processing time. Plus you can view your invoices and make payments simply and securely from one Web site. If you choose to make an online payment, you will receive a confirmation e-mail for your records. If you prefer to mail your payment, you can print the bill; return the top portion or payment coupon along with your payment to the remittance address on the invoice. Please keep in mind that payments are due on the specified due date to avoid a late payment fee.

The e-bill is updated on the last business day of each month (except September and January); therefore, daily transactions after that date will not show up on your e-bill until the last business day of the following month.

Refunds of Tuition Charges

University policy for the refund of tuition charges provides a percentage refund based on the time of withdrawal. Students who withdraw officially or who are dismissed from the university for any reason may be entitled to a partial refund in accordance with the established schedule shown below. Fees are nonrefundable.

Fall 2008 Withdrawal/Refund Schedule

Week 1	August 25–August 30	100%
Week 2	August 31–September 6	95%
Week 3	September 7–September 13	85%
Week 4	September 14–September 20	80%
Week 5	September 21–September 27	75%
Week 6	September 28–October 4	70%
Week 7	October 5–October 11	60%
Week 8	October 12–October 18	55%
Week 9	October 19–October 25	50%
Week 10	October 26–November 1	40%

No refund after November 1, 2008

Spring 2009 Withdrawal/Refund Schedule

Week 1	January 7–January 10	100%
Week 2	January 11–January 17	95%
Week 3	January 18–January 24	90%
Week 4	January 25–January 31	80%
Week 5	February 1–February 7	75%
Week 6	February 8–February 14	70%
Week 7	February 15–February 21	60%
Week 8	February 22–February 28	55%
<i>Spring Break</i>	February 28–March 8	
Week 9	March 9–March 14	50%
Week 10	March 15–March 21	45%

No refund after March 21, 2009

Tuition Payment Program

The VANDY Plan is a monthly payment option administered by Sallie Mae. Pamphlets describing this plan are available on request from the Office of Student Accounts or the Office of Student Financial Aid or visit the Web site at www.vanderbilt.edu/stuaccts.

Late Payment of Fees

All charges not paid by the specified due dates will be assessed a late payment fee of \$1.50 on each \$100 owed with a minimum of \$5.00.

Financial Clearance

Current charges can be deferred if a Student Account Agreement is on file in the Office of Student Accounts (the Office of Student Accounts may refuse to allow a deferment if in its judgment the deferment is unwarranted). However, a late payment fee will be assessed each month until the balance is paid. All amounts deferred are due no later than November 30 for the fall semester, April 30 for the spring semester, and July 31 for the May and summer sessions.

No transcript will be issued for a student who has an outstanding or deferred balance. Diplomas of graduating students will be withheld until all bills are paid.

Activities and Recreation Fees

The required student activities and recreation fees entitle degree-seeking students to use the facilities of Sarratt Student Center and the Student Recreation Center. The fees also cover admission to certain social and cultural events and subscriptions to certain campus publications. The activities fee for graduate students also includes funding for activities sponsored by the Graduate Student Council. Specific information on these fees is published annually in the *Student Handbook*. By payment of an additional fee, students and their spouses may use their identification cards for admission to athletic events.

The student activities fee and the student recreation fee will be waived automatically if the student is a *part-time* student registered for four or fewer semester hours and not registered in a thesis or dissertation research course, or if he or she resides, while a student, beyond an approximate sixty-mile radius from the campus as determined by ZIP code. Students who register late or students who want to have fees waived due to exceptional circumstances must petition for a waiver through the Office of Student Athletics, Recreation, and Wellness, VU Station B #356206, 2301 Vanderbilt Place, Nashville, Tennessee 37235-6206. A \$10 charge is assessed for processing the waivers of students who register late. No waivers are granted after the end of the semester in which the fee occurs.

Transcripts

Official academic transcripts are supplied by the University Registrar on authorization from the student. Transcripts are not released for students with financial or other university holds.

Honor Scholarships

Harold Stirling Vanderbilt Graduate Scholarships and University Graduate Fellowships

Each year several Harold Stirling Vanderbilt Graduate Scholarships and University Graduate Fellowships are awarded to students entering a Ph.D. program for the first time. Based solely on merit, they are offered to students nominated by departments or programs in recognition of exceptional promise for research and academic excellence.

Harold Stirling Vanderbilt Graduate Scholarships. These scholarships provide a stipend of \$6,000 per year in addition to regular assistantship or fellowship awards. Faculty committees review nominations from all graduate programs and make recommendations to the Graduate School which then selects the recipients.

University Graduate Fellowships. These premier fellowships provide a stipend of \$10,000 in addition to a department's best award (fellowship or assistantship). Recipients are selected in the same manner as for the Harold Stirling Vanderbilt Graduate Scholarships.

Provost's Graduate Fellowships

Each year the Graduate School awards Provost's Graduate Fellowships to outstanding students from under-represented groups showing academic promise, who intend to teach at the college or university level, and who want to study for the Ph.D. These fellowships carry a stipend of \$10,000 in addition to a department's best award.

Normally all three of these awards run concurrently with the departmental awards.

Other Awards and Assistantships

The university intends, within its resources, to provide adequate financial assistance to students with high academic potential who need help in meeting expenses. Some support is service free; most requires assigned service to the university. Duties are compatible with the student's development and progress.

All applicants to the Graduate School are considered for awards and assistantships available in their proposed area of study if they request such consideration and if the application for admission is complete by January 15.

University Fellowships

University fellowships with stipends up to \$25,500 are available in some programs. A full Tuition Scholarship is normally provided in addition to the stipend. The fellowships are service-free and the student is expected to devote full time to graduate study and to have no other occupation.

Teaching Assistantships

Teaching assistantships are awarded for the twin purposes of attracting superior students and providing supervised assistance to faculty in the instruction of undergraduate students. Assistants receive a stipend ranging up to \$19,500 for nine months or \$26,700 for the calendar year and normally receive an additional service-free full tuition scholarship. Duties are assigned by the program director and require up to twenty hours of work each week. Appointments are made for one year with renewal in subsequent years dependent upon satisfactory performance of assigned duties, as evaluated by the program director and school deans. Graduate teaching assistants are expected to pursue graduate study full time.

All persons who have responsibility for instruction, including graduate teaching assistants, are subject to university policies as outlined in the *Faculty Manual*, and any additional school and departmental policies that govern instruction. Graduate teaching assistants with major instructional responsibilities must have a master's degree or the equivalent.

Research Assistantships

Research assistantships ranging up to \$36,694 for twelve months are available in certain graduate programs. The holder is expected to assist an individual faculty member in research. Full or partial tuition scholarships may accompany a research assistantship.

Traineeships

Traineeships ranging up to \$32,000 for twelve months are available in certain graduate programs. The recipient is expected to carry out research with an individual faculty member. Full or partial tuition scholarships usually accompany a traineeship.

Tuition Scholarships

Some departments or programs (e.g., the Graduate Department of Religion, programs in the School of Engineering, Hearing and Speech Sciences) offer service-free full or partial tuition scholarships without an accompanying fellowship or assistantship.

Teacher Training Awards

A number of 50 percent tuition awards are available to candidates for the Master of Arts in Teaching degree. In addition, some programs offer fellowships or assistantships as well as service-free tuition scholarships to M.A.T. students.

Other Graduate Fellowships

Various types of financial assistance other than university assistantships and fellowships are available. A number of private foundations and business and industrial firms support fellowships. The U.S. Government provides training grants for Ph.D. programs through the U.S. Public Health Service, the National Institutes of Health, and other agencies. Awards are allocated to specific departments and to inter departmental graduate programs of study. Traineeships provide stipends up to \$21,000 for the calendar year and cover tuition and fees.

Loan Assistance

Loan assistance is available for graduate students in the form of subsidized and unsubsidized loans through the Federal Stafford Loan program, the Federal Perkins Loan program, the Federal Graduate PLUS Loan program, and certain alternative/private loan programs. Eligibility for the Federal Subsidized Stafford Loan and Federal Perkins Loan is based on financial need, but the Federal Unsubsidized Stafford Loan is available regardless of need. However, students are required to complete the need-based application process before a Federal Unsubsidized Stafford Loan may be awarded. The Federal Graduate PLUS Loan is not based on demonstrated need, but the student must be credit worthy. Alternative/private loans are available from private sources that are not based on financial need. We recommend that students apply for federal loans first and then pursue additional sources of funding if necessary.

Under the Federal Perkins Loan program, a graduate student may borrow up to a maximum annual limit of \$6,000, and the maximum aggregate amount of loans an eligible student may borrow is \$40,000, including any Federal Perkins Loans borrowed for undergraduate study. Under the Federal Stafford Loan program, a student may borrow up to a maximum annual limit of \$20,500 a year (\$8,500 subsidized and \$12,000 unsubsidized). The maximum aggregate amount of loans an eligible student may borrow is \$138,500 (\$65,500 subsidized and \$73,000 unsubsidized), including any Federal Stafford Loans borrowed for undergraduate study. Under the Federal Graduate PLUS Loan program, a graduate/professional student may borrow up to the annual cost of attending Vanderbilt minus any other aid for which the student is eligible. There is no maximum aggregate limit.

In order to be considered for the Federal Stafford Loan programs, Federal Perkins Loan, and/or the Federal Work-Study program, students must complete the Free Application for Federal Student Aid (FAFSA) and the Vanderbilt Graduate and Professional Financial Aid Application. Both applications and additional information may be found on the Office of Student Financial Aid Web page, www.vanderbilt.edu/financialaid/gradprof.htm.



KIRKLAND HALL

Academic Regulations

VANDERBILT'S students are bound by the Honor System inaugurated in 1875. Fundamental responsibility for the preservation of the system inevitably falls on the individual student. It is assumed that students will demand of themselves and their fellow students complete respect for the Honor System. All work submitted as a part of course requirements is presumed to be the product of the student submitting it unless credit is given by the student in the manner prescribed by the course instructor. Cheating, plagiarizing, or otherwise falsifying results of study are specifically prohibited under the Honor System. The system applies not only to examinations but also to written work and computer programs submitted to instructors. The student, by registration, acknowledges the authority of the Graduate Honor Council.

The university's Graduate Student Conduct Council has original jurisdiction in all cases of non-academic misconduct involving graduate and professional students.

Students are expected to become familiar with the *Rules Governing the Graduate Honor Council of Vanderbilt University*, available at the time of registration. It contains the constitution and bylaws of the Graduate Student Honor Council, Appellate Review Board, and related regulations.

Detailed descriptions of Honor System violations and procedures are also available on the Web at www.vanderbilt.edu/gradschool.

Academic Requirements

Candidates for graduate degrees must have satisfactorily completed all residency, academic course, and thesis or dissertation requirements, have passed all prescribed examinations, and be free of indebtedness to the university at the time of graduation.

The academic requirements described on the following pages have been established by the Graduate Faculty and are applicable to all graduate students at Vanderbilt.

Individual degree programs may have additional requirements. Students are advised to refer to the various program descriptions listed in this catalog and to consult their major advisers for requirements in the specialty of interest.

Students who were completing undergraduate or advanced degrees at the time of their admission must provide to the Graduate School, before initial registration, an official final transcript showing that the degree has been received and the date it was granted.

Intent to Graduate

An Intent to Graduate form must be submitted to the Graduate School at the beginning of the semester in which the student expects to receive a

degree. Students should check the University Academic Calendar each semester to determine deadline dates. Intent to Graduate forms are available at the Graduate School Web site, www.vanderbilt.edu/gradschool.

Requirements for the Master's Degree

The following master's degrees are awarded in the Graduate School: Master of Arts, Master of Science, Master of Fine Arts, Master of Arts in Teaching, and Master of Liberal Arts and Science. Students should check regulations of their particular program; many have requirements in addition to those listed here.

Residence

The candidate for the master's degree shall spend at least one academic year of graduate study at Vanderbilt. Candidates for the master's degree are expected to be enrolled in the Graduate School during each fall or spring semester until completion of degree.

Course Work

A minimum of 24 semester hours of formal, didactic course work is required for the master's degree. All requirements for the master's degree must be completed within a six-year period calculated from the student's first semester of enrollment in the Graduate School. International students should contact the Office of International Student and Scholar Services concerning time limitations for completion of master's degrees.

On recommendation of the student's program and approval of the Graduate School, credit up to 6 semester hours toward the master's degree may be transferred from graduate schools in accredited institutions, or other Schools of the university.

An incoming graduate student deficient in areas the major department considers prerequisite to a graduate program shall take such course work without graduate credit, in addition to the courses required for the advanced degree.

Thesis

The thesis is submitted in addition to the minimum 24 hours of course work required for the master's degree, and must give evidence of original investigation in the major subject. Two copies of a printed thesis must be turned in to the Graduate School. The title page of both copies must contain the original signatures of at least two graduate faculty members in the student's program. The abstract must contain the original signature of the thesis adviser. Specifications about required format, including the quality paper to be used, are available at www.vanderbilt.edu/gradschool. Both copies of the thesis will be placed in the Vanderbilt library system. There is a \$36 binding fee.

Electronic submission is encouraged. There is a minor change to the electronic title page. Other format requirements are identical. The document is converted to a PDF and uploaded on the ETD (electronic theses and dissertations) Web site. Two hard copies of the title page and one

copy of the abstract, printed on the specified paper, must be delivered to the Graduate School. There are no fees.

Due dates are listed on page 6.

Some programs require an examination or defense in addition to the thesis.

Non-Thesis Programs

Certain programs offer non-thesis master's degree programs and specify additional course work up to at least 30 hours. Some programs also require an examination in addition to the 30 hours in lieu of a thesis. Not later than fourteen days prior to the end of the term, the student's department will verify that all degree requirements have been completed.

Master's Degree in Passing

Certain departments offering the Ph.D. degree allow, as an alternate to the master's thesis requirement, passing the Ph.D. qualifying examination and the completion of at least 42 hours of graduate study. Students should consult the chairs of their departments or with their graduate advisers to determine whether such an optional plan is available in their program.

Final Examination

The candidate for the master's degree may, at the discretion of the program faculty, be required to take a final examination in the field of specialization. Such examination shall be completed not later than fourteen days before the end of the term in which the degree is to be granted.

Requirements for the M.L.A.S. Degree

A minimum of 30 semester hours of academic credit (ten courses) is required, with at least seven M.L.A.S. courses (21 hours) and the option of selecting the remaining three courses (9 hours) from the regular course offerings available to graduate students. Students normally take only one course each semester. All work must be completed within six years of the initial registration. A maximum of 6 credit hours may be transferred from graduate schools of other accredited universities and will count as part of the 9-hour non-M.L.A.S. course work.

Curriculum

A range of courses is offered from the disciplines of the liberal arts, including core courses for beginning students and selected topics courses, available to students after successful completion of two core courses. When nine M.L.A.S. credit hours have been earned, students may select up to three courses offering graduate credit from the regular schedule of courses (M.L.A.S. discount tuition does not apply to the courses from the regular schedule).

Requirements for the Ph.D. Degree

The degree of Doctor of Philosophy is awarded in recognition of high attainment in a special field of knowledge, as evidenced by examination

and by a dissertation presenting the results of independent research. General requirements are listed below. In many programs there are additional requirements, and students should carefully check regulations in their particular programs.

Admission to Candidacy

Admission to the Graduate School does not imply admission to candidacy for the Ph.D. degree. To be admitted to candidacy the student must satisfy the language requirements, if any, in the program, and must pass a qualifying examination. The examination will be administered by the student's Ph.D. committee, which will supervise subsequent work toward the degree. Upon completion of these requirements the Ph.D. committee will recommend to the Graduate School that the student be admitted to candidacy.

Residence and Course Work

The Ph.D. degree requires at least three academic years of graduate study. A student must complete 72 hours of graduate work for credit, of which a minimum of 24 hours in formal, didactic course and seminar work in the Vanderbilt Graduate School is required. In most programs students are required to present considerably more hours in formal course work than the 24-hour minimum. The remainder of the 72 hours, above the program requirements in formal course hours, may be in dissertation research hours, in special readings, and in transfer credit if applicable. Performance in dissertation research does not affect the grade point average.

"Formal, didactic course work" is approved courses taken for credit other than thesis and dissertation research courses. Students should check departmental regulations for the number of "formal course" hours required for their particular program.

All students working full time toward the Ph.D. must register each fall and spring semester. When the required 72 hours of course work have been completed, registration for dissertation research without hourly credit applies; this reflects full-time effort on research and confers full-time student status. The minimum tuition of \$200 is charged.

Qualifying Examination

The purpose of the qualifying examination is to test the student's knowledge of the field of specialization, to assess familiarity with the published research in the field, and to determine whether the student possesses those critical and analytic skills needed for a scholarly career.

The examination is conducted by a Ph.D. committee appointed by the Graduate School on advice of the chair or director of graduate studies of the program. The committee consists of not fewer than four members of the Graduate Faculty. Three of the members must be graduate faculty from within the student's department/program and one from outside the program. Any variation of the committee makeup must be approved by the Graduate School. The committee must be appointed by the Graduate School no less than two weeks before the time the student expects to take the qualifying examination.

The functions of the Ph.D. committee are (a) to administer the qualifying examination, (b) to approve the dissertation subject, (c) to aid the student and monitor the progress of the dissertation, and (d) to read and approve the dissertation and administer the final oral examination.

The qualifying examination may be administered at any time during the school year and shall be completed within a period of four weeks. Before a qualifying examination can be scheduled, the student must have completed at least 24 hours of graduate work (to include all course work required for the degree) and the language requirement, if any. In some programs the student may be required to demonstrate basic competence in the discipline through a written preliminary examination prior to the actual qualifying examination.

All departments and other units of offering Ph.D. programs must set a maximum time limit within which a student, under normal circumstances, is required to take the qualifying examination. That maximum time limit must not exceed four years.

The qualifying examination may be written or oral, or both. The Graduate School must be notified of the time and place of the qualifying examination at least two weeks in advance. The qualifying examination is not a public examination, and voice recordings of it are not permitted. A student is allowed only two opportunities to pass the qualifying examination. The qualifying examination results form, signed by the committee members and the director of graduate studies for the program, shall be forwarded to the Graduate School immediately after the examination.

When the student has passed the qualifying examination, the Ph.D. committee shall recommend to the Graduate School that the student be admitted to candidacy for the degree.

Dissertation

A candidate for the Ph.D. degree must present an acceptable dissertation. The dissertation demonstrates that the candidate has technical competence in the field and has done research of an independent character. It must add to or modify what was previously known, or present a significant interpretation of the subject based upon original investigation. The subject of the dissertation must be approved by the student's faculty adviser and Ph.D. committee.

The dissertation must be completed within four years after a student has been admitted to candidacy for the degree. Upon petition to the Graduate School, a one-year extension of candidacy may be granted. If such a period has expired without successful completion of the dissertation, the student may be dismissed from the Graduate School. Readmission to the Graduate School, and to candidacy, requires application to the Graduate School, with approval of the program faculty. In such cases the student may be required, by the Graduate School or by the Ph.D. committee, to demonstrate competence for readmission by taking a qualifying examination or additional course work.

The candidate submits a copy of the completed dissertation to the Ph.D. committee at least two weeks prior to the dissertation defense. The committee reviews the dissertation and conducts the final examination.

Final copies of the approved dissertation may be submitted to the Graduate School in electronic or printed form. Style specifications, paper requirements, fees, and further details are listed at www.vanderbilt.edu/gradschool. With either option, two copies of the title page, with the original signatures of not less than a majority of the Ph.D. committee, and two copies of an abstract of not more than three hundred fifty words, signed by the student's adviser, must be turned in to the Graduate School by the date specified on page 6. Students who submit their dissertations electronically revise the title page, convert the documents to a PDF file, and upload the document on the Electronic Theses and Dissertations (ETD) Web site, etd.library.vanderbilt.edu.

All dissertations/theses are microfilmed. Microfilming does not preclude publication by other methods, but microfilming is tantamount to publication and a microfilmed dissertation, if not copyrighted, is in the public domain and may not subsequently be copyrighted in its original form. The Graduate School will obtain a copyright for students who wish to have their dissertation copyrighted. Microfilming, binding, and copyright fees must be paid at the time the dissertation is turned in to the Graduate School. The abstract is published in *Dissertation Abstracts*, which publicizes the completion of the dissertation and announces its availability on microfilm.

Final Examination

The candidate must pass his or her dissertation defense at least fourteen days before the end of the term in which the degree is to be conferred, or by April 1 for May graduation. The final oral examination is administered by the student's Ph.D. committee and is on the dissertation and significant related material; the student is expected to demonstrate an understanding of the larger context in which the dissertation lies. The public is invited to attend the final examination, which is announced in advance in Vanderbilt's electronic calendar.

The chair of the Ph.D. committee or the director of graduate studies of the program, after consultation with the candidate, shall notify the Graduate School in advance of the place and time of the examination and the title of the dissertation. This should be done no later than two weeks prior to the examination. The Graduate School then formally notifies the Ph.D. committee and submits the defense notice to Vanderbilt's electronic calendar. The dissertation defense results form, signed by the committee members and the director of graduate studies for the program, should be forwarded immediately to the Graduate School.

Further Requirements

It should be understood that the requirements stated above are minimum and that individual programs may add others. Students are urged to consult individual program entries in this catalog and departmental chairs and directors of graduate studies to learn the requirements of programs in which they are interested.

Language Requirements for the Master's and Ph.D. Degrees

The language requirements, if any, for the master's and Ph.D. degrees in each graduate program are determined by the program faculty, and are set forth in this catalog in the section devoted to program descriptions and course offerings.

Foreign language requirements are usually met by demonstration of proficiency in one or more of the following: French, German, or Spanish. Certain programs either permit or require proficiency in other languages; and some others restrict the choice to certain combinations within this group. Students should refer to the various program statements in this catalog and should consult their advisers regarding specific requirements.

Examinations in languages are usually administered by the appropriate language faculty by arrangement with the program. As an alternative to certification of proficiency by examination, the Graduate School may accept certification from the program that the minimum requirement in a language has been met if the student is able to present an acceptable academic record of the equivalent of at least 12 semester hours in the language.

A student who has fulfilled the language requirement at another graduate school prior to entering Vanderbilt may, at the discretion of the program and the Graduate School, transfer the certification if the student does so within three years after having received it.

International students may petition the Graduate School through the program to substitute their native language for one of the usual languages required for the Ph.D. degree.

Registration

The normal academic, full-time registration is 9 to 13 hours per semester (6 to 9 hours in the summer). Students registered for 9 or more didactic hours per semester (6 or more hours in the summer) are defined as full time. Those registered for 6–8 didactic hours (3 to 5 hours in the summer) are half time, and those registered for less than 6 hours (less than 3 hours in the summer) are part time. After completing the hourly requirements for the degree, full-time students register for master's (369) or Ph.D. (379, 399) research without hourly credit to reflect full-time effort on research. Certain programs offer a half-time Ph.D. research course (3995) for students who are able to devote only half-time effort to dissertation research.

During each semester currently enrolled students are asked to meet with their advisers and directors of graduate studies to plan their schedules for the coming semester. All students must later complete official registration at the appropriate time using OASIS (Online Access to Student Information Systems). At the beginning of each semester and the summer session, students must validate their registration by submission of an online registration data form. A late registration fee of \$30 is charged to students who fail to register by the stated registration dates.

All full-time graduate students must register each fall and spring semester with no breaks in registration to remain in good standing. In addition, all graduate students receiving scholarship, assistantship, fellowship, or traineeship support through the university must be registered

each fall and spring semester as well as summer sessions in which they receive support.

Changes in Registration

Changes in registration may be made through OASIS during the change period (the first ten class days of the semester) with consent of the major department. A student is not permitted to add or drop a course, change the number of hours in a variable-credit course, or change from audit to credit status after the end of the change period. A student may formally withdraw from a course after the end of the change period with the permission of the department, and a grade of *W* will be given. After the mid-point of the semester, a student is not permitted to withdraw from the course. Students should note, in the section on tuition and fees, the regulations concerning tuition obligations for courses dropped after the first week of the term.

Courses in which there is a significant change in subject matter each semester (e.g., special topics courses) may be repeated for credit within limits noted in the course listings of this catalog.

Grading System

The grading system in the Graduate School includes the letter grades *A*, *B*, *C*, *D*, and *F*. A student will not be granted graduate credit for any course in which a grade less than *C* is received. Grades below *C* may be repeated once at the discretion of the course director and the department. In this situation, the more recent grade will be calculated in the final grade point average. The letter *I* may be used at the discretion of the instructor in those cases in which the student is not able to complete work in the normal time. The notation *W* is entered onto the transcript when a student withdraws from a course or from the Graduate School. A grade point average of 3.0 is required for graduation.

Letter grades are assigned grade point values as follows:

A+ = 4.0	C = 2.0
A = 4.0	C- = 1.7
A- = 3.7	D+ = 1.3
B+ = 3.3	D = 1.0
B = 3.0	D- = 0.7
B- = 2.7	F = 0.0
C+ = 2.3	

Students receive grades in all courses except those approved for credit/non-credit, audits, and some seminars. An *I* that is not replaced by a letter grade within one year may be changed to the grade *F* at the discretion of the instructor; otherwise, the *I* may become permanent and remain on the transcript as such.

Certain courses approved by the graduate faculty for credit/non-credit or Pass/Fail count toward total hours. Courses that are strictly no-credit, however, do not count toward total hours or in calculating grade point average, although grades for such courses are entered on the student's record.

With the instructor's permission, students are permitted to audit certain courses. Students who audit are expected to attend the course regularly.

Students must be registered for regular courses in order to audit. Audits are listed on the student's transcript. Audits are limited to two per semester.

Grade Change Policy

For a student enrolled in the Graduate School, a grade recorded in the University Registrar's Office may be changed only upon the written request of the instructor, endorsed by the appropriate official (usually an associate dean) within the school/college that offered the course, and then the approval of the associate dean of the Graduate School. An instructor's petition to change a grade must include a brief rationale for the change. Changing a recorded grade is a serious matter and, in general, petitions will be approved only upon certification that the original grade was in error or, in the case of an Incomplete, that the outstanding requirement(s) have been completed. Request for exceptions to this policy should be directed to the associate dean of the Graduate School and will be considered on an individual basis; these may require additional certifications and approvals.

Academic Probation

A grade point average of 3.0 is necessary for graduation. Students who fall below an average of 3.0 are placed on probation for one semester. If the student's performance does not improve during that semester, the Graduate School and the appropriate department chair will decide whether to dismiss the student or to allow the continuation of probation. If at the end of the second semester the grade point average is still below 3.0, the student may be advised to withdraw or face dismissal. Students who earn a grade point average of 2.0 or less during their first semester of residence are subject to dismissal at the end of that semester.

Student Grievances and Appeals

Students who believe their academic performance has not been judged reasonably or fairly, or who believe their intellectual contributions have not been fairly acknowledged, should discuss their concerns with the director of graduate studies in their program or, as necessary, the chair of the department. If the student's concerns cannot be resolved at the program or departmental level, the student may then request a further review of the issues in question by the associate dean for graduate studies or similar official in their school dean's office. The student may appeal the outcome of the school-level review to the Graduate School.

Credit

Courses not listed in this catalog that are numbered in the 200s and 300s may be taken for credit by graduate students on the recommendation and consent of the faculty adviser and the director of graduate studies, unless some limit is noted in the description. Not all courses offered by various divisions of the university have been approved by the Graduate Faculty for graduate credit. In arranging schedules, students should consult their advisers and carefully check the Graduate School catalog for approved courses.

Students may register for graduate courses or other courses in the university on a non-credit basis—either to fulfill their own interests or to meet certain prerequisites and requirements. The designation “no-credit” presupposes the student’s participation in the course, including written assignments and examinations. Grades are received and recorded in no-credit courses and tuition is billed at the regular hourly rate.

Transfer Credit

Graduate credit may be transferred from graduate schools in accredited institutions. Students should not assume that all graduate credit earned at other institutions will be transferred. Transfer is made on the recommendation of the chair or director of graduate studies of the major department and approval of the Graduate School.

Only those hours in which the student has achieved the grade *B* or its equivalent will be considered for transfer. Grades earned on transferred credit do not affect the student’s Graduate School average unless such courses are to be counted as didactic hours.

A maximum of 6 semester hours of transfer credit may be applied toward the master’s degree and, in very special cases, 48 hours toward the Ph.D. (See requirements for the master’s degree and Ph.D. degree elsewhere in this catalog.)

Students who want to transfer to the Graduate School from professional degree programs offered by other schools at Vanderbilt must submit a formal application for admission and are expected to do so not later than the end of their first year of graduate-level studies at Vanderbilt.

The Graduate School does not transfer courses taken by students while registered in the university’s Division of Unclassified Studies, no matter what the level of the course.

Special Students

Non-degree students may register for selected courses in areas where they are qualified. Such students must submit an application and transcript(s) of their previous academic work with the Graduate School. Approval of the instructor, the department in which the course is offered, and the Graduate School is required. GRE scores are not required. Status as a non-degree student is expected to last no longer than one year. No more than 6 semester hours earned as a non-degree graduate student may be applied to graduate degrees at Vanderbilt.

The Graduate School also accepts as transient students graduate students enrolled in other universities. Such students may obtain graduate credit for transfer or to meet requirements in their home institution. Transient students are normally not admitted to the university for more than one year and are not candidates for a degree. Prior to enrollment, transient students must submit an application, a transcript of their previous academic record, and a letter of good standing from the institution in which they are enrolled.

Leave of Absence

The Graduate School requires continuous registration except for summer sessions. Students who want to interrupt their graduate study must apply to the Graduate School and receive an authorized leave of absence. Leave of absence is granted for a maximum of one year. Those without authorized leave who do not register are dismissed from the Graduate School and are not considered students. If they want to resume graduate study at Vanderbilt, they must apply for reinstatement.

Withdrawal

Students who intend to withdraw from the university should inform the department, who then informs the Graduate School in writing. Improper notification may result in loss of credit or other financial penalties.

Credit for Graduate Courses Taken as an Undergraduate

A qualified Vanderbilt University senior undergraduate may enroll in graduate courses and receive credit which, upon the student's admission to the Graduate School, may be applicable toward a graduate degree. Undergraduate seniors interested in this option should review the regulations appearing in the *Undergraduate Catalog* and consult their advisers and the Graduate School. Undergraduates should note that those wanting to take 300-level courses, whether under this option or not, must obtain the written approval of their academic adviser, the instructor of the course, and the Graduate School.

In certain special cases, credit may be transferred for graduate-level course work completed during undergraduate degree studies by a student at another accredited institution. The course hours must be in excess of the minimum required for the undergraduate degree and the course(s) must not be a required part of the undergraduate degree or major. Requests for such transfer of credit must be carefully justified by the student's major department and approved by the Graduate School.

Commencement

The university holds its annual Commencement ceremony following the spring semester. Degree candidates must have completed successfully all curriculum requirements and have passed all prescribed examinations by the published deadlines to be allowed to participate in the ceremony. A student completing degree requirements in the summer or fall semester will be invited to participate in Commencement the following May; however, the semester in which the degree was actually earned will be the one recorded on the diploma and the student's permanent record. Students unable to participate in the graduation ceremony will receive their diplomas by mail.



Courses of Study

THESE listings give faculty, programs, and course offerings of the various departments and programs offering graduate instruction. The names and ranks of faculty members engaged in graduate instruction are shown with these department and program listings.

Explanation of Symbols

200-level courses listed in this catalog may be taken by graduate students for credit unless a specific restriction is indicated in the course description and provided there is no duplication of the student's previous courses.

300-level courses and above listed in this catalog are graduate courses. They are on a level normally considered too high for undergraduates and are not open to undergraduates without consent of the instructor, the adviser, and the Graduate School. Courses in the graduate program in religion carry four-digit numbers. Generally, courses in religion numbered greater than 3000 are at a higher level than those numbered 2000.

Length of a course (one semester or two) is indicated by whether it has a single or double number. Double-number courses may be divided at the option of the student if the numbers are *different*.

210–211. Note that numbers are different, indicating that students may take either semester without the other, at their own option. In the election of such options, students must not disregard statements of prerequisites or the major department's requirements.

220a–220b. Note that numbers are the same, indicating a year-long course.

The semester in which a one-semester course is offered is indicated by the word FALL (or SPRING) in the course description, or FALL, SPRING in the case of a course offered both semesters. All two-semester courses begin in FALL and end in SPRING unless the course description specifies otherwise.

Hours referred to are semester hours, and figures in brackets always indicate semester hours credit—e.g., 3 for one semester and 3–3 for a two-semester course.

Formal course work means all courses taken for credit except thesis and dissertation research courses.

The university reserves the right to change the arrangement or content of courses, to change texts and other materials used, or to cancel any course on the basis of insufficient enrollment or for any other reason.

*DO NOT
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American Studies

DIRECTOR Teresa Goddu

✦ VANDERBILT University's program in American Studies offers an interdisciplinary graduate certificate program. The certificate in American Studies has been designed to complement students' disciplinary training, expose them to interdisciplinary trends in the academy, and broaden their career possibilities. The American Studies certificate provides graduate students with training across an array of American Studies disciplines as well as training in interdisciplinary methodology. The certificate provides students with a valuable professional credential and strengthens their ability to compete for jobs as well as national fellowships and postdoctoral awards.

The certificate in American Studies is open to any student enrolled in graduate study at Vanderbilt University. Acceptance to the program requires the approval of both the graduate director of the student's home department and the director of the American Studies Program. Students must also submit an application that includes a one-page rationale for their course of study to the American Studies Graduate Committee for approval. Courses taken at Vanderbilt University prior to admission to the program may be counted toward the certificate requirements with the approval of the director. The awarding of a certificate requires an overall GPA of 3.3, satisfactory performance of B+ or better in AMER 300, completion of all distributional requirements, and successful completion of the Graduate Certificate paper.

Please contact the American Studies Program for more information at americanstudies@vanderbilt.edu or phone (615) 343-8724.

Requirements for Graduate Certificate in American Studies

1. American Studies 300.
2. Four additional graduate-level American Studies courses appropriate to the student's program of study. Courses must be approved by the Graduate Committee for credit and should include at least three courses outside the student's home discipline. The student's total course work must include courses from at least three different departments. One course may be satisfied through an independent study with a faculty member affiliated with the American Studies Program, with the approval of the director of American Studies. (See below for a list of approved graduate courses.)
3. A paper (thirty pages) submitted to the Graduate Committee for evaluation. The paper must demonstrate the application of an American Studies methodology to research, teaching, or fieldwork. It should be a synthesis of interdisciplinary American Studies work in the context of the student's primary field.

300. Graduate Workshop in American Studies. Issues, methodologies, traditions, approaches, and problems in the inter disciplinary field of American Studies. SPRING. [3] Nelson.

Approved List of Courses

AMERICAN STUDIES: 300, Graduate Workshop in American Studies.

ECONOMICS: 329a–329b, Labor Economics.

ENGLISH: 320, Studies in American Literature; 321, Studies in Southern Literature; 325, Seminar in British and American Literature (when an American topic is offered); 337a, Introduction to Literary Theory (when an American topic is offered); 337b, Special Topics in Literary Theory (when an American topic is offered); 350, Special Problems in English and American Literature (when an American topic is offered); 355, Special Topics in English and American Literature (when an American topic is offered).

HISTORY: 371a, Studies in Early American History to 1783; 372a, Studies in the Middle Period of American History, 1783–1861; 373a, Studies in United States History, 1861–1900; 374a–374b, Studies in Recent American History; 375, Seminar in Recent American History; 378a, Studies in History of the South; 380a, Studies in American Diplomatic History; 381, Topics in American History; 384a, Studies in American Social History; 384b, Seminar in American Social History; 385a–385b, Studies in the Intellectual History of the United States.

PHILOSOPHY: 350, Readings in Philosophy (when an American topic is offered); 351, History of Philosophy (when an American topic is offered); 352, Topics in Philosophy (when an American topic is offered); 353, Figures in Philosophy (when an American topic is offered); 363, Modern Philosophy (when an American topic is offered); 364, Nineteenth-Century Philosophy (when an American topic is offered); 365, Twentieth-Century Philosophy (when an American topic is offered).

POLITICAL SCIENCE: 330, Studies in American Politics; 331, Party Politics; 332, Political Parties and Electoral Behavior; 333, Political Culture, Opinion, and Behavior; 335, Politics of American Legislation; 336, The Judicial Process; 339, Research in American Politics; 370, Topics in Political Science (when an American topic is offered).

SOCIOLOGY: 301, Classical Sociological Theory and Major Theorists; 302, Contemporary Theory; 331, Survey Seminar on Inequalities and Movements; 333, Survey Seminar on Cultural Sociology; 335, Survey Seminar on Deviant Behavior and Social Control; 339, Survey Seminar on Political Sociology; 343, Survey Seminar on Social Psychology; 345, Survey Seminar on Social Stratification; 361, Special Topic Seminars on Social Phenomena at the Macro Level; 363, Special Topic Seminars on Institutions and Organizations; 367, Special Topic Seminars on Norms, Power, and Related Normative Phenomena; 368, Special Topic Seminars on Social Processes and Social Change.

SPANISH AND PORTUGUESE: 354, The Politics of Identity in Latino U.S. Literature.

WOMEN'S AND GENDER STUDIES: 301, Gender and Sexuality: Feminist Approaches; 302, Gender and Pedagogy.

Anthropology

CHAIR Lesley Gill

DIRECTOR OF GRADUATE STUDIES Beth A. Conklin

PROFESSOR EMERITUS Ronald Spores

PROFESSORS Arthur A. Demarest, Tom D. Dillehay, Edward F. Fischer, Lesley Gill,
Thomas A. Gregor

ASSOCIATE PROFESSORS Beth A. Conklin, William R. Fowler Jr., John Janusek,
Norbert Ross

ASSISTANT PROFESSORS Pierre Colas, Sergio Romero, Miriam Shakow, Shubhra Sharma,
Tiffany Tung, Steven A. Wernke

DEGREES OFFERED: *Master of Arts, Doctor of Philosophy*

✂ THE graduate program in anthropology is designed to prepare students for careers in teaching and research with an emphasis in specializations on the anthropology of Central America, Mexico, and South America. The graduate enrollment of approximately thirty graduate students assures a close tutorial relationship with faculty and ample student opportunities for field research and publication in Latin America.

Requirements for the master's degree in anthropology include 24 hours of course work, a comprehensive examination, and a thesis. An alternative master's degree track involves 36 hours of course work and a comprehensive examination, rather than a thesis. Although students are expected to acquire a general knowledge of anthropology, the program encourages independent research on special subjects, particularly in archaeology, ethnography, ethnohistory and native languages of Latin America.

The Ph.D. program requires at least 45 hours of formal course work and four semesters of residency. A high level of proficiency in one foreign language is expected. Doctoral candidates pass general examinations, present and defend a dissertation proposal, complete a dissertation on original field or archival research, and defend the dissertation. Subject to the approval of the director of graduate studies, students entering the program with a master's degree or with studies elsewhere may transfer up to 18 hours of graduate credit.

201. Introduction to Linguistics. Systematic study and analysis of human language. For maturation of language sounds, sound systems, the structure of words, the structure of sentences, meaning, language change. Data from diverse languages of the world. FALL. [3] Romero.

203. Anthropological Linguistics. An introduction to the study of language in its anthropological context. Language and culture, the structure of symbolic systems, vocabulary as a guide to the ways societies classify their universe. Linguistic analysis as a tool for ethnographic investigation. FALL. [3] Romero.

206. Theories of Culture and Human Nature. Survey of the views of anthropological thinkers, from the late nineteenth century to the present, about the basic attributes of humankind and human culture. Comparison of different ideas of how people create culture and in turn are molded by culture. FALL. [3] Colas.

207. Energy, Environment, and Culture. The relationship between human beings and the environments that sustain them. The global diversity of human ecological adaptations.

Hunter-gatherers, pastoral nomads, slash-and-burn agriculturalists, and irrigation agriculturalists. Human impact on the environment. Theories of human ecological interaction. [3] (Not currently offered)

209. Human Diversity. The concept of "race." Racial variation and the perception of human differences. The biological basis for human variation. [3] (Not currently offered)

210. Peoples and Cultures of Latin America. Survey of Latin America, including both its native cultures and its Spanish and Portuguese heritage. Fundamental traditions of Latin America, including marriage and the family, the relationship between men and women, racial and ethnic identity, social class, and religion. Special attention to the organization of peasant communities, contemporary urban life, poverty, and economic development. [3] (Not currently offered)

211. Archaeology. An introduction to the methods used by archaeologists to study the nature and development of prehistoric societies. Approaches to survey, excavation, analysis, and interpretation are explored through lectures, case studies, and problem assignments. SPRING. [3] Fowler.

212. Ancient Mesoamerican Civilizations. Development of pre-Hispanic civilization in Mesoamerica from the beginnings of village life to the rise of the great states and empires: Olmec, Maya, Toltec, and Aztec civilizations. FALL. [3] Fowler.

213. The Archaeology of the Ancient Maya Civilization. The civilization of the ancient Maya peoples, the most advanced culture of the pre-Columbian New World. Lectures and readings cover the archaeological evidence and social theory on the enigmatic origins, complex nature, and sudden collapse of this ancient civilization. [3] (Not currently offered)

214. North American Indians. A comparative survey of the Indian societies of North America, their archaeological origins, development, and changing adaptation to white society over the past four hundred years. [3] (Not currently offered)

215. The Collapse of Civilizations. Causes of the decline or collapse of complex societies. Old World and New World examples. Historical, anthropological, and paleoecological theories and controversies. FALL. [3] Demarest.

216. Ancient Cities. Comparative examination of early cities in the Old World and pre-Columbian America. Analysis of social and economic processes supporting pre-industrial urbanism. Role of geography, ideology, trade, and settlement systems in the rise of early urban societies. [3] (Not currently offered)

217. Old World Archaeology. Ancient Cultures of the Old World. Archaeology of the Near East, Africa, Asia, and Oceania. The origins of the great civilizations of Egypt and Mesopotamia. The beginnings of cities, agriculture, trade, and empires in light of recent archaeological discoveries. [3] (Not currently offered)

218. Reconstructing Prehistoric Economic Systems. Anthropological and economic theory in prehistoric archaeology. Methods for reconstructing prehistoric economic systems. Models for production and exchange. [3] (Not currently offered)

219. Comparative Writing Systems. The origins, development, and social uses of writing in the ancient Middle East, Mediterranean, and Mesoamerica. Decipherments of hieroglyphic systems. Literacy, historiography, and cross-cultural translation. SPRING. [3] Colas.

220. Peoples and Cultures of Mexico. Indian, peasant, and urban cultures in Mexico from late pre-Hispanic times to the present. Ethnic and regional diversity, urban-rural relationships, class structure, and national integration. [3] (Not currently offered)

221. Maya Language and Literature. Introduction to a contemporary Maya language. Linguistic analysis and cultural concepts. By permission of instructor. May be repeated once

for different language for a maximum of six credit hours. [Variable credit: 1–6] Staff. (Not currently offered)

222. Anthropologies and Archaeologies of Community. Creation, maintenance, and transformation of communities through time. Discussion of “community” as a village or settlement. [3] (Not currently offered)

223. Colonial Encounters in the Americas. Theoretical discussion of colonialism as a socio-cultural process. Comparative colonialism in pre- and post-Hispanic contexts. Methodological consideration of archaeological and archival analyses and their complementary epistemological statuses. Pan-American case studies. [3] (Not currently offered)

224. Political Anthropology: Crosscultural Studies in Conflict and Power. Comparative and ethnographic analysis of political and legal systems. Formal and informal means of control in egalitarian and hierarchical societies. Anthropological theories of power, authority, influence, and leadership. Social and cultural dimensions of conflict, consensus, competition, and dispute resolution. [3] (Not currently offered)

225. The Archaeology of Ancient Asia. Development of Asian culture from the Ice Age hunter-gatherers to the first civilizations of China, Japan, Thailand, Indochina, Indonesia, and the Philippines. [3] (Not currently offered)

226. Myth, Ritual, Belief: The Anthropology of Religion. Crosscultural survey of religious and ritual beliefs in the light of theories of religion. Topics include sacrifice, myth, witchcraft, divination, religious change, and millenarian movements. SPRING. [3] Ross.

228. Family, Marriage, and Kin. The family, household, division of labor, and obligations of kinship in non-Western societies. Marriage, age and gender, and kinship networks in relation to economics and political life. Comparisons with kinship in Western cultures. [3] (Not currently offered)

229. North American Archaeology. The origins of native North American culture. Migration from Asia, early hunters and gatherers, and the extinction of ancient fauna. Evolution of social complexity, ecological adaptations, and prehistoric interaction as seen in the archaeological record of the continent. [3] (Not currently offered)

230. Environment and Archaeology. Human impact on environment, subsistence, and settlement. The contribution of archaeology, geology, and botany to human ecology. [3] (Not currently offered)

231. Colonial Encounters in the Americas. Theoretical discussion of colonialism as a socio-cultural process. Comparative colonialism in pre- and post-Hispanic contexts. Methodological consideration of the archaeological and archival analyses of colonial encounters and their complementary epistemological statuses. Pan-American case studies. SPRING. [3] Werneke.

232. The Anthropology of Globalization. Perspectives on globalization based on ethnographic case studies. The impact of new technologies on native cultures; different cultural meanings of global commodities; creation of new diaspora cultures; effects of neoliberal reforms on local economies; ethnic movements and terror networks. FALL. [3] Shakow.

233. Culture, Ecology, and International Development. Theories of development and social change in Third World societies. Case studies of development programs in peasant and tribal communities in Asia, Africa, and Latin America. Ecological, social, and political issues in problems of food and agriculture, rain forest development, and grassroots development strategies. [3] (Not currently offered)

234. Economic Anthropology. Modern and postmodern cultural organization of Western and non-Western economies. Crosscultural comparison of concepts of self-interest and rationality;

relation of the growth of post-industrial (service and information) economies to economic strategies of ethnic groups; survey of indigenous alternatives to development. Theoretical issues grounded in case studies from our own and other cultures. [3] (Not currently offered)

237. Ethnicity, Race, and Culture. Key concepts used in the history of anthropology to explain social diversity; theories of racial typology, cultural traditions, and ethnic identity. Role of rituals and symbols in expressing social identity and group membership. Cross-cultural comparison of pluralistic and homogeneous societies. Relation of ethnicity to ties of kinship, language, heritage, religion, and nationality. Changes in inter-ethnic relations through assimilation, acculturation, cooperation, and polarization. [3] (Not currently offered)

240. Medical Anthropology. Biocultural aspects of human adaptations to health, disease, and nutrition. Non-Western medical and psychiatric systems. Effects of cultures on the interpretation, diagnosis, and treatment of illness. Case studies from Africa, Oceania, Latin America, and the contemporary United States. FALL. [3] Conklin.

241. Peoples and Cultures of Oceania. Cultural adaptations by Melanesian, Polynesian, and Micronesian peoples of the Pacific Islands. Topics include ecology, religion, exchange, warfare, and male/female relationships. [3] (Not currently offered)

243. European Ethnography. Modern cultures and societies of Europe. Comparative survey based on ethnographic case studies; national differences and ethnic minorities; challenges of nationalism and globalization; rural and urban economic adaptations; transition of former socialist states. [3] (Not currently offered)

246. Peoples and Cultures of the Andes. Historical and archaeological background, languages, economy, environment and cultural adaptation of Andean peoples. Spanish and native American heritage. Religion, family structure, political organization, contemporary social issues, and economic background. Urban and rural traditions, social movements, and change. FALL. [3] Shakow.

247. The Aztecs. Origins of the Aztec peoples of central Mexico and their culture; history and structure of the Aztec empire; pre-Columbian social, political, and economic organization; warfare and religion; the Spanish conquest; colonial society in central Mexico; ethnographic study of modern descendants of the Aztecs. [3] (Not currently offered)

248. Ancient Empires and Civilizations of South America. Introduction to the archaeology and peoples of ancient South America. Early hunters and gatherers, origins of agriculture and urbanism, and the rise and fall of the Huari and Inca empires. [3]

249. Indigenous Peoples of Lowland South America. Native societies of Amazonia, the Orinoco basin, and other forest, savanna, and coastal regions of South America. Ecology, cosmology, social organization, and political relations in historical and contemporary populations. Colonial, inter-ethnic relations, government policies, human rights, environmentalism, sustainable development, and indigenous activism and advocacy. [3] (Not currently offered)

250. Anthropology of Healing. The role of ritual, symbols, belief, and emotion in health, illness, and therapeutic processes. The practices and politics of healing in Western and non-Western societies, including shamanism, faith healing, ecstatic religious experience, alternative medicine, and biomedicine. Mind-body interactions, medical pluralism, relations between patients and healers, and implications for improving medical care. [3] (Not currently offered)

251. Chiefdoms. The origins, evolution, and organization of the world's chiefdoms and other pre-state societies. The rise of social stratification and political hierarchies. The organization of production and exchange. A comparative perspective with ethnographic, historical, and archaeological evidence. [3] (Not currently offered)

252. Native American Art. The art and aesthetics of native peoples throughout the Americas. The relationship of art to social life, myth, and religion. Changes since contact with European cultures. [3] (Not currently offered)

254. The Inca Empire. The rise and fall of the Inca state in the Southern American Andes. Inca society, agriculture, economy, warfare, ancestor worship, mummies, and royal wealth. Imperial expansion, the role of the feasting in Inca politics, and place of ecology in Inca religion. Destruction of the empire during the Spanish conquest; persistence of pre-Columbian culture among Inca descendants in Peru and Bolivia. SPRING. [3] Wernke.

255. Native North American Art. (Also listed as History of Art 255) The art and great aesthetic traditions of the native peoples, emphasizing North America, including the Southwest, Northwest Coast, and the Plains. The relationship of art to social life, myth, and religion. Changes since contact with European cultures. [3] (Not currently offered)

259. Maya Culture and Ethnography. Survey of the different cultural groups of the Maya peoples of Mexico and Guatemala. Comparison of cultural features and social and political history. Relationship of culture and language. Introduction to the Maya language family with a focus on Tzotzil. SPRING. [3] Ross.

260. Medicine, Culture, and the Body. (Also listed as History 206) Concepts of the human body from historical and cross-cultural perspectives. Exploration of experiences, representations, and medical theories of the body in birth, death, health, and illness in Western and non-Western societies. Comparison of methodologies of anthropology and history. [3] (Not currently offered)

261. Classic Maya Language and Hieroglyphs. Linguistic analysis of Classic Maya Hieroglyphs from A.D. 100–1000. Methods of decipherment, reading, and interpreting an ancient script. Theories of languages and elite literacy. Investigations of intertwining religion and politics. [3]

262. Cognitive Anthropology. A survey of methods and approaches in linguistics and the cognitive sciences. Exploration of culture and thought; how culture affects our ways of reasoning. [3] (Not currently offered)

263. Myth and Legend: The Anthology of Oral Tradition. Narrative traditions and folklore of Western and non-Western cultures. Myths of world creation, human origins, and transformation. Relationship of myth to dream, historical narrative, and social organization. Myth telling and performance. The structure and theory of myth. [3] (Not currently offered)

264. Human Nature and Natural Law: Perspectives from Science and Religion. Conflicting views on the origins of morality and values. Ethical beliefs as deriving from culture or as reflecting a global human nature. Consideration of human universals such as the incest taboo, marriage and family, and religion. Efforts to interpret values and ethical principles as reflecting human biology and evolution, self-interest, altruism, and cooperation. [3] (Not currently offered)

265. Psychological Anthropology. (Also listed as Sociology 265) How personality and culture affect each other. Socialization and the life cycle, the definition of sex roles, individual psychology and group aggression, religion and group personality, and the nature of mental illness and normalcy in non-Western societies. FALL. [3] Gregor.

266. Gender and Cultural Politics. Crosscultural comparison of women's roles and statuses in western and non-Western societies. Role of myths, symbols, and rituals in the formation of gender identities and the politics of sexual cooperation, conflict, and inequality. Case studies from Africa, the Middle East, Europe, North and South America, Asia, and Melanesia. [3] (Not currently offered)

- 267. Life, Death, and the Human Body.** Biological and social perspectives on the human body through the life cycle. Concepts of gender, health, sickness, and the nature of beauty and bodily adornment. The linguistics of body language and language that describes the body. The relationship of body, soul, afterlife, and spiritual beliefs. FALL. [3] Tung.
- 270. Human Osteology.** Anatomy of the human skeleton. Determination of age, sex, stature, and biological affinity from bones and dentition. Analysis of archaeological skeletal remains for diagnosis of disease and identification of cultural practices. Use of human remains in criminal investigation. FALL. [3] Tung.
- 271. Human Evolution.** Structural and behavioral changes in hominids leading to modern *Homo sapiens*. Evolutionary theory, paleontological evidence, and nonhuman primates as the bases for interpreting sequential development of pre-modern humans. Prerequisite: 103. [3] (Not currently offered)
- 272. Human Variation.** Biological differences among contemporary human groups. Adaptational features of humans as biological organisms. Use of biological variation for understanding human history and geographic distribution. [3] (Not currently offered)
- 273. Primate Evolution.** Evolution and diversification of primate order from the first primates to the rise of the Great Apes. Skeletal anatomy, evolutionary theory, and living primates as bases for exploring the development of nonhuman primates. Prerequisite: 103 or 173. [3] (Not currently offered)
- 274. Health and Disease in Ancient Populations.** Paleopathology of mummies and skeletons. Skeletal evidence for violence and warfare. Gender and social status differences in diet, disease, and activity patterns to reconstruct ancient social organization. Biological relationships among ancient and modern populations. Ethics and federal law in the study of human remains. Laboratory analysis of skeletons. SPRING. [3] Tung.
- 275. Sociocultural Field Methods.** Research design and proposal writing, access to data, ethical issues, sampling techniques, interviewing questionnaire design and question writing, data analysis. [3] (Not currently offered)
- 276. Modern Yucatec Maya.** Present-day Yucatec Maya as spoken in Yucatan and Belize. Methods of linguistic analysis. Basic speaking, comprehension, and writing skills. FALL. [5] Colas.
- 280. Introduction to Geographic Information Systems and Remote Sensing.** Computerized graphics and statistical procedures to recognize and analyze spatial patterning. Spatial data-collection, storage and retrieval; spatial analysis and graphic output of map features. Integration of satellite imagery with data from other sources through hands-on experience. Assumes basic knowledge of computer hardware and software. SPRING. [3]
- 281. Classic Maya Religion and Politics.** Anthropology of politics and religion in Classic Maya culture, A.D. 100–1000. Interpretation of Classic Maya iconography and epigraphy. SPRING. [3] Colas.
- 282. Settlement Patterns and the Human Landscape.** Sociocultural processes and human-environment interactions in the formation of landscapes and settlement systems. Relationship of archaeology and cultural anthropology in the understanding of social space, sacred landscapes, urban plans, and historical ecology. Cross-cultural comparisons. Methods of interpretation and quantification. [3] (Not currently offered)
- 284. Problems in Anthropological Theory.** An advanced seminar in anthropological theory: cultural evolution, cultural history, ethnic relations, cultural ecology, archaeological method and theory, social structure, political organizations, religious institutions. [3] (Not currently offered)

288a–288b. Independent Research. Readings on selected topics (of the student's choice) and the preparation of reports. FALL, SPRING, SUMMER. [Variable credit: 1–3 each semester] Staff.

289. Field Research. Directed field research (on topics of the student's choice). FALL, SPRING, SUMMER. [Variable credit: 1–6 each semester] Staff.

294. Special Topics in Anthropology. FALL. [3] Audet, Demarest.

302. Quantitative Methods in Anthropology. Statistical methods for anthropological problem solving. Univariate and bivariate statistics, with selective coverage of more complex multivariate techniques. Use of standard software. [3] (Not currently offered)

303. Seminar in Maya Ethnography . Ethnographic survey of the Maya of Mexico and Guatemala; historical and current data, methods, theories. FALL. [3] Fischer.

307. Human Variation and Osteology. Survey of physical and genetic variation in modern human populations. Laboratory techniques in osteological analysis. [3] (Not currently offered)

309. Seminar in Culture Ecology. Concepts, theories, and methods of the study of culture ecology. Exploitation of the environment from hunting and gathering bands to industrial states. Role of ecology in the rise, growth, and collapse of complex societies. [3] (Not currently offered)

310. Archaeological Method and Theory . Development of archaeology as a discipline; relationships with anthropology and history; intellectual trends. Prerequisite: consent of instructor. [3] (Not currently offered)

311. Formal and Qualitative Approaches in Anthropology. Introduction to formal and experimental methods in cultural anthropology. Exploration of statistical methods to enhance ethnographic descriptions and the scientific impact of data. [3] (Not currently offered)

314. History of Anthropological Theory I. An advanced consideration of the history of anthropological theory from its origins to the mid-twentieth century. FALL. [3] Gregor.

315. History of Anthropological Theory II. An advanced consideration of the history of anthropological theory from the mid-twentieth century to the present. SPRING. [3] Colas.

316. Anthropology of Adaptation. Concept of adaptation in anthropology. Method and theory in human ecology and environmental archaeology. [3] (Not currently offered)

317. Seminar in Anthropological Archaeology. Middle range theory, site formation, systematics, subsistence, settlement, social organization, ideology, culture change, processual and post-processual approaches. [3] (Not currently offered)

320. Seminar in Ethnography. Ethnographic method and theory. Techniques of describing and understanding unfamiliar cultures. Prerequisite: consent of instructor. [3] (Not currently offered)

321. Seminar in Social Organization. The study of organization from a comparative perspective. [3] (Not currently offered)

322. Culture, Structure, Personality. Integrative anthropological approaches to human behavior examining symbolism, values, the organization of the group, interaction and psychology. SPRING. [3] Gregor.

323. Seminar on Political Economy and Anthropology. Covers foundational works in political economy and economic anthropology. Focus on what culture adds to classical and neoclassical economic models. Anthropological approaches to political economy and globalization. [3] (Not currently offered)

- 325. The Collapse of Civilizations: General Theories and the Maya Collapse.** An advanced consideration of the causes and processes involved in the decline of complex societies. General theory is then illustrated by detailed interactive study of the evidence and interpretations of the collapse of the civilization of the Classic Maya, arguably the New World's most advanced society. A seminar allowing each student to develop and define their own perspective on this major problem in archaeology and social theory. [3] (Not currently offered)
- 328. Violence and Its Embodiments in the Past and Present.** Anthropology and bioarchaeology of violence in ancient and modern communities. Bioarchaeological theory and method to identify trauma and violence against the body. Study of war and other forms of violence, including domestic abuse, ritual battles, corporeal punishment. [3] (Not currently offered)
- 329. The Anthropology of Death: Body, Place, and Memory.** Cultural responses to death in Western and non-Western societies. Emphasis on issues of how social relations, emotion, and memory are shaped in relation to ideas and practices focused on the body and the significance of places as sites of identity. Theory and perspectives from anthropology, religion, and philosophy. [3] (Not currently offered)
- 330. Research Design in Anthropology.** Research design, formulating research questions, and definition of appropriate data and methods. [3] (Not currently offered)
- 331. Preindustrial Political Systems.** History, structure, and change of pre-modern political systems around the world. [3] (Not currently offered)
- 335. Space, Place, and Landscape.** Cross-disciplinary approaches to the significance of space and landscape for human societies in the past and present. [3] (Not currently offered)
- 340. Historical Archaeology.** Development, practice, methods, and theoretical perspectives in historical archaeology; relationships between archaeology and history. [3] (Not currently offered)
- 349. The Historical Archaeology of Latin America.** The study of archaeological, historic, and ethnohistorical materials in examining the conquest, colonization, and process of culture change in Latin America. [3] (Not currently offered)
- 350. Seminar in Mesoamerican Archaeology.** The prehistory of pre-Columbian civilizations of Mexico and Central America. May be repeated for credit if topics are sufficiently different. SPRING. [3] Fowler.
- 351. Seminar in Oaxacan Archaeology.** The origins of agriculture, rise and fall of Zapotec and Mixtec civilizations, ideology, economics, interregional interaction, and ethnohistory. [3] (Not currently offered)
- 355. Seminar in Mesoamerican Art.** [3] (Not currently offered)
- 360. Seminar in South American Archaeology and Ethnohistory.** The prehistory of pre-Columbian civilizations of the Andean and lowland regions of South America. [3] (Not currently offered)
- 367. Special Topics.** Problems, themes, or issues in anthropological theory and methods. May be repeated with change of content. FALL, SPRING. [3] Conklin.
- 369. Master's Thesis Research.** [0]
- 379. Non-candidate Research.** Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]
- 399. Ph.D. Dissertation Research.**

Arabic

210a–210b. Elementary Arabic. Development of reading, listening, speaking, and writing skills. FALL, SPRING. [5] Hamad.

220a–220b. Intermediate Arabic. Practice and development of all language skills at the intermediate-advanced level. Intensive work in spoken Arabic with emphasis on vocabulary acquisition, reading comprehension, and writing skills. Advanced grammar, modern Arabic word formation, verb aspect usage, and structure of complex sentences. Three hours of class work per week with an additional two hours a week of individual work in the language laboratory. Prerequisite: 210b or equivalent credit by examination. FALL, SPRING. [4–4] Staff.

230a–230b. Advanced Arabic. Further development of listening, reading, speaking, and writing skills in the Arabic language. Emphasis on grammar and literary techniques. Prerequisite: two years of Arabic or equivalent. FALL, SPRING. [3–3] Hamad.

Archaeology

See Classical Studies and Anthropology

Astronomy

See Physics and Astronomy

Biochemistry

CHAIR Michael R. Waterman

DIRECTOR OF GRADUATE STUDIES David Cortez

PROFESSORS EMERITI Harry P. Broquist, Frank Chytil, Stanley Cohen,

Leon W. Cunningham, Benjamin J. Danzo, Willard R. Faulkner, Robert A. Neal,
Oscar Touster

PROFESSORS Richard N. Armstrong, Richard Breyer, Jorge H. Capdevila,

Richard Caprioli, Graham F. Carpenter, Bruce Carter, Walter Chazin, Martin Egli,
F. Peter Guengerich, David Hachey, Carl G. Hellerqvist, Scott W. Hiebert, Billy Hudson,
Tadashi Inagami, Daniel C. Liebler, Lawrence J. Marnett, David E. Ong, Neil Osheroff,
John A. Phillips III, Jennifer Ann Pietsenpol, Ned Porter, Carmelo Rizzo, Charles R.
Sanders, Samuel A. Santoro, Virginia L. Shepherd, Michael Stone, Gary Sulikowski,
Conrad Wagner, Michael R. Waterman

RESEARCH PROFESSORS Essam E. Enan, Carol Rouzer

ADJUNCT PROFESSORS Kip Guy, Dean A. A. Myles, Brenda A. Schulman

ASSOCIATE PROFESSORS David Cortez, Thomas N. Oeltmann, James Patton,
Paul Voziyar

RESEARCH ASSOCIATE PROFESSORS Pierre Chaurand, David Friedman, Amy Joan Ham,
Zigmund Luka, Raymond L. Mernaugh, Jarrod Smith

ASSISTANT PROFESSORS Brian Bachmann, Tina Iverson, Diane Keeney, Borden Lacy, Andrew Link, Zu-Wen Sun, Munirathinam Sundaramoorthy, David Tabb
RESEARCH ASSISTANT PROFESSORS David Blum, Dale Cornett, Gerald Frank, Joel M. Harp, Zeljka Korade, Galina Lepesheva, Hong-Jun Liao, Laura S. Mizoue, Jeffrey Myers, Jashim Uddin, Audrey I. Zavalin, Lisa Zimmerman

DEGREE OFFERED: *Doctor of Philosophy*

✦ STUDENTS interested in this program participate in the Interdisciplinary Graduate Program in the Biomedical Sciences during their first year (see Biomedical Sciences). The second year of study comprises required and elective course work including Biochemistry 300, 301, 302, 303, 327, 330, 336, 337, 343, 349, and 352 for a total of at least 24 hours of formal course work toward the Ph.D. degree (including sixteen hours in the first year). A thesis-based master's degree is awarded only under special circumstances.

The program offers students fundamental training in biochemical principles and an opportunity to apply such fundamental knowledge to vital biological and medical problems.

The intent of the department is to maintain a small graduate program that emphasizes quality of experience, academic scholarship, and professional achievement. Faculty members are involved in active research programs. Thirty to thirty-five graduate students are generally enrolled. To maintain close student-faculty interaction, only a limited number of students are admitted each year.

Major research efforts are concerned with studies on mechanisms of mutagenesis; cytochromes P450, regulation of expression and mechanisms of detoxification; oxygenase and arachidonic acid biochemistry; vitamin A binding proteins and metabolism and action of vitamin A; proteinase inhibitor structure and regulation; DNA-binding proteins; DNA topoisomerase; biochemistry of epidermal growth factor action; biochemistry and endocrinology of hypertension; intracellular signaling in growth and development; neoplastic transformation by oncogenic transcription factors; cellular responses to DNA damage; chromatin structure and histone modifications; and one-carbon metabolism. These studies use state-of-the-art technology including molecular biology, NMR spectroscopy, mass spectrometry, and X-ray crystallography.

Faculty of the department also participate in inter disciplinary training programs, supported by National Institutes of Health training grants, to offer specialized biochemical training in the areas of molecular toxicology, biochemical nutrition, molecular biophysics, cancer research, reproductive biology, and molecular endocrinology.

300. Introduction to Structural Biology. Introduction to methods to determine the three-dimensional structures of biological macromolecules and macromolecular complexes at or near atomic resolution. Techniques covered include X-ray crystallography, NMR, EPR and fluorescence spectroscopies, cryo-electron microscopy, and computational modeling. Emphasis is placed on practical aspects of each technique and the range of applications for which each technique is applicable. The course is given during the first third of the semester, just preceding Biochemistry 303. SPRING. [1] Chazin and Staff.

301. Molecular Structure and Function. This course considers the use of biochemical methods to answer important questions of function in systems involving two interacting species. Topical examples of protein-protein, protein-ligand, protein-nucleic acid, and nucleic acid-nucleic acid interactions are considered. Each example illustrates the use of multiple complementary approaches, which may include mutagenesis, kinetic, chemical, spectroscopic, and in vitro selection methods. SPRING. [2] Armstrong, Egli, Guengerich.

302. Advanced Biochemistry, Cell Biology, and Genetics. Advanced concepts in genetics, biochemistry, and cell biology will be reviewed using a combination of lectures and discussion sections based on published manuscripts. Prerequisite: IGP core course or consent of instructor. FALL. [3] Carpenter, Hiebert, Cortez, Sun.

303. Biomolecular X-Ray Crystallography. Introduction to the theory and practice of X-ray crystallography for the determination of the three-dimensional structure of biological macromolecules at atomic resolution. Topics to be covered include X-ray diffraction, symmetry and space groups, crystallization, data collection, phasing, model building, refinement and validation. Prerequisite: Biochemistry 300, Introduction to Structural Biology. SPRING. [2] Egli, Eichman, Harp, Iverson, Spiller, Sundaramoorthy.

323. Special Problems and Experimental Techniques. Opportunity to master advanced laboratory techniques while pursuing special problems under direction of individual members of the faculty in areas of their specialized interests. Admission to course, hours, and credit by arrangement. FALL, SPRING, SUMMER. [Variable credit: 1–6] Cortez and Staff.

325. Special Topics in Biochemistry. Introduction to current research through the biochemical literature. Given on an individual basis by arrangement. May be taken more than once, but not for more than 2 hours credit with a single adviser, nor for more than 4 hours total. May be taken concurrently with 323 with a different adviser. Prerequisite: consent of instructor. FALL, SPRING, SUMMER. [Variable credit: 1–2] Carter and Staff.

327. Seminar in Biochemical Literature. Development of skills required for effective oral presentation of research results. Course format includes lectures and student presentation of selections from the current literature. Advanced students may present their own work. Admission to course by arrangement. Prerequisite: a course in fundamental biochemistry. FALL. [1] Ong, Wagner.

330. Scientific Communication. Development of skills in writing grant proposals, based on NIH instructions. The topic of the proposal is open, but usually will be the project selected for the dissertation. Critiques of the individual proposals are provided at scheduled intervals. Students not working for a degree in Biochemistry must have the consent of instructor. SPRING. [1] Ong, Osheroff.

336. Biochemical Toxicology and Carcinogenesis. (Also listed as Chemistry 336) Chemical and biological aspects of toxicology and carcinogenesis, including basic principles and mechanisms, metabolism and enzymology, cellular biology, chemistry of reactive intermediates, and a survey of several classes of environmentally important compounds. Prerequisite: organic chemistry and general biochemistry. Three lectures per week. FALL. [3] Armstrong, Guengerich, Liebler, Marnett, Pietenpol, Porter, Stone.

337. Molecular Aspects of Cancer Research. (Also listed as Cell and Developmental Biology 337) A focused series of seminars and discussions to explore the molecular basis of cancer. Seminars rely heavily on extramural speakers with recognized expertise in selected research areas. Discussion sections led by a faculty member follow each series of three to four seminars. Prerequisite: 321. SPRING. [1] Carpenter and Staff.

343. Biomolecular NMR Spectroscopy. Introduction to the theory and practice of Nuclear Magnetic Resonance (NMR) spectroscopy for the study of the structure, dynamics, and biochemistry of biological macromolecules. After introducing the basic concepts of NMR and

formalisms for predicting the outcome of experiments, topics to be covered will include multidimensional NMR, scalar and dipolar couplings, chemical exchange, relaxation, resonance assignment strategies, and determination of 3D structures. Prerequisite: Biochemistry 300, Introduction to Structural Biology. FALL. [3] Chazin, Krezel, Sanders, Stone.

349. Graduate Seminar in Molecular Biophysics. (Also listed as Biological Sciences 349) Introduction to research areas of current interest through examination of key publications in the preceding year. The weekly meetings consist of open discussions of assigned readings led by multiple student teams. May be repeated for credit. Prerequisite: consent of instructor. SPRING. [1] Chazin and Staff.

352. Analytical Proteomics. Introduces analytical proteomics methods and approaches through lectures, directed readings, and group and individual data analysis exercises. Topics include (a) characteristics of proteomes and protein diversity, (b) mass spectrometry approaches to protein and peptide analysis, (c) protein and peptide separation methods, (d) bioinformatics tools for identification of proteins from MS data, (e) quantitative proteomics methods, (f) applications of proteomics in common experimental designs, (g) tissue proteome profiling and imaging approaches. SPRING. [2] Chaurand, Friedman, Ham, Liebler, Slebos, Tabb, Zhang, Zimmerman.

369. Master's Thesis Research.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

399. Ph.D. Dissertation Research.

Biological Sciences

CHAIR Charles K. Singleton

DIRECTOR OF GRADUATE STUDIES Douglas G. McMahon

PROFESSORS EMERITI Burton J. Bogitsh, Sidney Fleischer, Robert Kral, Oscar Touster, John H. Venable, Dean P. Whittier, Robley C. Williams Jr.

PROFESSORS Kendal S. Broadie, Clint E. Carter, Ellen Fanning, Todd R. Graham, Carl H. Johnson, Owen D. Jones, Wallace M. LeSturgeon, David E. McCauley, Douglas G. McMahon, Terry L. Page, James G. Patton, Charles K. Singleton, Lilianna Solnica-Krezel, Gerald J. Stubbs, Laurence J. Zwiebel

ASSOCIATE PROFESSORS Kenneth C. Catania, Daniel J. Funk, Andrzej M. Krezel

ASSISTANT PROFESSORS D. Kilpatrick Abbot, Seth Bordenstein, Kefyn M. Catley, Brandt F. Eichman, Katherine L. Friedman, Joshua T. Gamse, Julian Hillyer, Chris Janetopoulos, Daniel J. Kaplan, Antonis Rokas, Donna J. Webb

RESEARCH ASSISTANT PROFESSORS Irina Bruck, Jeff Rohrbough, Diane Sepich, Shin Yamazaki, Yao Xu, Daoqi Zhang

SENIOR LECTURERS Steve J. Baskauf, Amanda R. Benson, A. Denise Due-Goodwin, Mark A. Woelfle

DEGREES OFFERED: *Master of Science, Doctor of Philosophy*

✦ RESEARCH activities in the Department of Biological Sciences encompass the study of biology at the molecular, subcellular, cellular, organismal,

population, and community levels. The faculty have primary research interests in the areas of protein structure and function, protein transport, membrane ion channels and receptors, signal transduction, posttranscriptional control of gene expression, DNA replication and recombination, biological clocks, development, neurobiology, vector biology, insect physiology, ecology and evolution, and bioinformatics.

Students interested in this program may apply for direct admission in the Biological Sciences graduate program, or they may enter through the Interdisciplinary Graduate Program (IGP) in the Biomedical Sciences (see Biomedical Sciences), and choose Biological Sciences as their home department by the end of the second semester.

The program is designed to lead to the Ph.D. degree; however, M.S. degrees are granted under special circumstances and require a research thesis. The Ph.D. degree requires 72 hours of credit for graduation, including at least 24 credit hours of formal course work with the remainder earned through dissertation research. Credit hours earned in the first year IGP program will be counted towards the required 24 hours of formal course work.

Desirable backgrounds for graduate study in the Department of Biological Sciences, depending upon the specific interests of the student, would be undergraduate programs emphasizing biological sciences, chemistry, mathematics, or physics course work, but students from other disciplines are also eligible.

Visit the departmental Web site at sitemason.vanderbilt.edu/biosci for more information,

Note: The following courses (described below) are usually not available for graduate credit for students in the Biological Sciences program: 201, 205, 210, 220. Graduate students in biological sciences may take graduate courses in School of Medicine departments by arrangement.

201. Introduction to Cell Biology. Structure and function of cells, subcellular organelles, and macromolecules. Fundamentals of organelle function, membrane transport, energy production and utilization, cell motility, cell division, intracellular transport and mechanisms of signal transduction. Prerequisite: Biological Sciences 110a–110b. SPRING. [3] Graham, Webb.

205. Evolution. Evolutionary theory, with emphasis on evolutionary mechanisms. Microevolutionary processes of adaptation and speciation and macro-evolutionary patterns. Evidence from genetics, ecology, molecular biology, and paleontology in the historical context of the neo-Darwinian synthesis. Three lectures per week. No credit for graduate students in biology. SPRING. [3] Funk, McCauley.

210. Principles of Genetics. Basic principles and mechanisms of inheritance are discussed and related to other biological phenomena and problems. Prerequisite: 110a–110b. FALL, SPRING. [3] Staff.

220. Biochemistry I. Structure and mechanism of action of biological molecules, proteins, nucleic acids, lipids, polysaccharides. Enzymology. Carbohydrate metabolism. Prerequisite: 110a–110b and Chemistry 220a–220b. FALL. [3] Krezel, Kaplan.

226. Immunology. The molecular and cellular basis of immunity. Emphasis on molecular structure, the genetic origin of diversity in B-cell and T-cell receptors, antigen presentation,

and the cellular interactions leading to the immune response. Tolerance, tumor and transplantation immunity, autoimmune and immunodeficiency diseases, and allergy. Prerequisite: 201 or 210. FALL. [3] Carter.

230. Biological Clocks. Study of innate mechanisms for measurement of time in living organisms. Emphasis on the functional significance and physiological basis of biological clocks in animals and humans. Topics include circadian rhythms, time-compensated celestial navigation, photoperiodism, and the role of biological clocks in human behavior. Not open to students who have taken 115: Biological Clocks and Human Behavior Prerequisite: 110a–110b. FALL. [3] McMahon.

235. Biology of Terrestrial Arthropods. Evolution, morphology, physiology, ecology, and behavior of terrestrial arthropods using a phylogenetic approach. Laboratory, field trips, and a collection required. Prerequisite: 110a–110b. SPRING. [4] Catley.

237. Ecology Lab. One three-hour laboratory and discussion period or field trip per week. Prerequisite or corequisite: 238. SPRING. [1] Due-Goodwin.

238. Ecology. Population biology, evolutionary ecology, community structure, with emphasis on species interactions, including competition, predation, and symbiosis. Prerequisite: 110a–110b. SPRING. [3] Abbot.

239. Behavioral Ecology. An evaluation and synthesis of some of the important problems at the interface of behavior and ecology. Evolution of society, kin selection and altruism, behavioral mechanisms of population regulation and competition, foraging theory, behavioral aspects of predator-prey interactions, courtship and mating systems, sociobiology and its implications. Three lectures and one discussion period per week. SPRING. [4] Leal.

243. Genetics of Disease. Application of genetics, cell biology, and molecular biology to the study of human diseases. Genomics, gene mapping, and molecular techniques. Animal models of disease. Chromosomal abnormalities, single-gene and multifactorial diseases, and epigenetics. Prerequisite: 210. FALL. [3] Gamse.

245. Biology of Cancer. Application of cell biology, molecular biology, and genetics to the study of cancer. Tumorigenesis; cellular oncogenes; growth factor signaling; tumor suppressor genes; apoptosis; metastasis and invasion. Prerequisite: 110a, 110b, and 201. FALL. [3] Webb.

246. Evolutionary Genetics. Fundamentals of population and quantitative genetics. Natural selection, gene flow, genetic drift, population structure, linkage disequilibrium and the analysis of polygenic traits, including genetic map-based approaches. Special emphasis will be given to the genetics of adaptation and speciation. Prerequisite: 205 and pre- or corequisite 210. [3] (Not currently offered)

247. Molecular Evolution. The theory of evolution at the molecular level. The evolution of DNA and RNA sequences, proteins, and genome structures will be studied using models from population genetics and comparative approaches. Molecular clocks, the evolution of gene regulation and globin genes, molecular phylogeny, and human evolution. Prerequisite: 210 and 205. [3] (Not currently offered)

252. Cellular Neurobiology. Structure and function of nerve cells. Emphasis on electrical excitability, synaptic transmission, and sensory transduction. Cellular mechanisms underlying simple behaviors, sensory information processing, and learning and memory. Prerequisite: 110a–110b. FALL. [3] Page.

253. Laboratory in Neurobiology. The neuroanatomy of the mammalian nervous system. Major subdivisions of the brain and comparative anatomy of mammalian nervous systems with an emphasis on the neocortex. Review of histological sections and gross anatomy of mammalian nervous system ranging from rodents to primates. Prerequisite: 111a–111b. SPRING. [1] Catania.

254. Neurobiology of Behavior. Nerve cell interactions in neuronal networks of the central nervous system of animals and their impact for regulating behavior. Sensory systems, sensory-motor integration, central processing of information, neuronal-hormonal interactions; and brain anatomy and organization in invertebrates and vertebrates. Prerequisite: 110a–110b. FALL. [3] Catania.

256. Molecules of the Brain. Molecules of neural wiring, involving cell identity, pathfinding, synaptogenesis. Molecules of nerve cell communication, with relationship to drugs of addiction and abuse. Molecules of nervous system plasticity, and the mechanistic bases of learning and memory. Relation of these mechanisms to causes of human neurological diseases. Prerequisite: 110a–110b. SPRING. [3] Broadie.

258. Vertebrate Physiology. Fundamental mechanisms of the major vertebrate physiological systems with an emphasis on humans. Special physiological adaptations of vertebrates to their environment (respiration of aquatic animals, birds, and deep-diving mammals; salt balance in fresh and salt water environments; altitude adaptation). Prerequisite: 201 or 220. SPRING. [3] Oeltmann, Carter.

262. Biomolecular Interactions. Energetics and kinetics of interactions between proteins and nucleic acids and their ligands. Topics include cooperativity, allostery, rates of binding reactions. Students will gain direct experience in computer use, but no programming is required. Prerequisite: 220 and Physics 117a–117b. One lecture and two calculation sessions per week. [3] (Not currently offered)

265. Biochemistry II. Mechanistic biochemistry of the expression, transmission, and maintenance of genetic information. Replication, transcription, translation, recombination, and DNA repair. Prerequisite: 220. SPRING. [3] Eichman, Krezel.

266. Advanced Molecular Genetics. Principles of classical and molecular genetic analysis: mutation and recombination, mapping, and the application of genetic methodology to the study of complex systems. Special emphasis on modern genomic approaches. Prerequisite: 210. SPRING. [3] Friedman.

267. Molecular Virology. Application of genetics, biochemistry, molecular and cell biology to the study of viruses. Virus structure and classification, viral strategies of gene expression, genome replication, particle assembly. Host defenses against viruses. Comparisons with other infectious agents. Discussion of real-world outbreaks. Prerequisite: 210; and 201 or 226 or 265. SPRING. [3] Fanning.

268. Molecular Membrane Biology. Biological membrane synthesis and its relationship to human disease. Regulation of cholesterol and phospholipid metabolism; integration of proteins into membranes; and trafficking of proteins and lipids. Prerequisite: 201. FALL. [2] Graham.

270. Statistical Methods in Biology. An introduction to statistical methods used in the analysis of biological experiments, including the application of computer software packages. Emphasis on testing of hypotheses and experimental design. Topics include descriptive statistics, analysis of variance, regression, correlation, contingency analysis, and the testing of methods for sampling natural populations. Prerequisite: 110a–110b. FALL. [3] McCauley.

273. Molecular Mechanisms of Environmental Toxins. Molecular interactions of environmental toxins with specific subcellular components and biochemical basis of their toxicity. Environmental mutagens, heavy metals, synthetic estrogens and other analogs of natural substrates, oxidants, and the question of synergy. Prerequisite: 210. FALL. [3] LeSturgeon.

274. Proteins. Molecular structures and biological functions of proteins. Underlying chemical and physical properties. Structural motifs and topology; folding and dynamics; enzyme catalysis; protein-DNA interactions. Structure-based drug design; protein symmetry;

supramolecular protein machines. Chemical and spectroscopic methods to probe protein structure and behavior in solution. Prerequisite: 220. FALL. [3] Eichman.

290. Special Topics in Biological Sciences. Topics offered vary and are cited in the *Schedule of Courses*. May be taken for credit more than once by permission of the director of undergraduate studies. Prerequisite: 110a–110b. SPRING. [3] Staff.

320. Graduate Seminar in Biological Sciences. May be taken for credit more than once. FALL, SPRING. [1] Staff.

324. Biology of Insects. An introductory survey of insects, with emphasis on diversity, taxonomy, and ecology. Two lectures and two laboratory periods per week before spring break; seven days intensive field work at Archbold Biological Station, Florida, during spring break; then individual study and final report preparation. [4] (Not currently offered)

332. Seminar in Biological Rhythms. FALL, SPRING. [Variable credit: 1–2] Page, Johnson.

336. Seminar in Ecology and Evolutionary Biology. FALL, SPRING. [Variable credit 1–2]

340. Developmental Biology. Genetic, molecular, and cellular mechanisms underlying development of eukaryotic organisms with emphasis on insects and vertebrate animals. Topics include regulation of gene expression during developmental processes, specification of embryonic polarity, generation and patterning of germ layers, organogenesis, axonal specificity, evolution of chordate body plan. Prerequisite: 201 and 210. FALL. [3] Solnica-Krezel, Zwiebel.

341. Focal Topics in Molecular Biology. In-depth analysis of three to four research areas in molecular and cell biology taught by experts in each subdiscipline through lectures and discussions of papers from the current literature. Prerequisite: IGP 300a or permission of instructor. FALL. [3] Staff.

357. Plant-Animal Interactions. Ecology and evolution of species interactions at individual, population, and community levels; coevolution; pollination biology; fruit and seed dispersal; mammal and insect herbivore and plant defense mechanisms; ant-plant and animal-fungus interactions. Prerequisite: 205. [3] (Not currently offered)

363. Macromolecular Structure Determination by X-Ray Diffraction. Principles of structure determination of biological macromolecules and assemblies by X-ray diffraction. Prerequisite: one semester of biochemistry and two semesters of calculus. [2] (Not currently offered)

364. Macromolecular Structure Determination by High Field NMR. Principles of structure determination of biological macromolecules by high field nuclear magnetic resonance spectroscopy. Prerequisite: one semester of biochemistry and two semesters of calculus. [2] (Not currently offered)

369. Master's Thesis Research. McMahan and Staff.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

385. Advanced Reading in Biological Sciences. Specialized topics under the guidance of a member of the department's faculty. Open to qualified graduate students only. Admission to course by arrangement. FALL, SPRING. [1–3] Staff.

390. Special Topics and Advanced Techniques in Biological Sciences. Specialized laboratory experiments, open to a limited number of properly qualified students. Admission to course, hours, and credit by arrangement. FALL, SPRING. [2–4] McMahan and Staff.

399. Ph.D. Dissertation Research. McMahan and Staff.

Biomedical Engineering

CHAIR Todd D. Giorgio

DIRECTOR OF GRADUATE STUDIES Robert J. Roselli

PROFESSORS EMERITI Thomas R. Harris, Paul H. King, Richard G. Shiavi

PROFESSORS Robert Lee Galloway Jr., Todd D. Giorgio, John Gore,

Frederick R. Haselton, E. Duco Jansen, Knowles A. Overholser, Robert J. Roselli,

John P. Wikswa

ASSOCIATE PROFESSORS Adam Anderson, Mark Does, Anita Mahadevan-Jansen,

Michael Miga, Cynthia B. Paschal, David R. Pickens III

ASSISTANT PROFESSORS Franz Baudenbacher, Prasad Shastri

DEGREES OFFERED: *Master of Science, Doctor of Philosophy*

✚ **BIOMEDICAL** engineering as a research discipline is concerned with the development of new physical and mathematical concepts applicable to problems of biology, medicine, and the organization of health care. Biomedical engineering also deals with more pragmatic problems, such as biomedical use of information systems and development of advanced biomedical instrumentation. The goal of the program is to provide advanced education and research training in quantitative biology, biomaterials, cellular bioengineering, physiological optics, medical imaging, biomedical instrumentation, and the scientific principles underlying the origination of therapeutic devices and processes. The program is specifically concerned with the interface between biology and the engineering, physical, computing, and mathematical sciences.

Candidates for the Master of Science must complete 24 hours of graduate-level courses, approved by the faculty, with the following minimum distribution: three courses in biomedical engineering, physiology (MPB 330) and one other life science course, and two courses in advanced science or engineering. All courses should carry a minimum of 3 semester hours of credit. At least two of the BME courses and one of the advanced science or engineering courses must be 300-level courses. One hour of BME seminar can count toward the total of 24 hours necessary for the M.S. degree. In addition, the candidate must submit a research thesis and give a final oral presentation.

The Master of Engineering degree, an advanced professional degree, is offered by the School of Engineering. This is a non-thesis degree, which includes 30 hours of course work and a design project.

Candidates for the Ph.D. degree must complete 36 semester hours of graduate-level didactic courses approved by the program faculty, excluding seminar, research, and teaching hours, and distributed as follows: 18 hours in biomedical engineering (15 hours should be 300 level), 6–7 hours of advanced life sciences (required: physiology (MPB 330), recommended: biochemistry, molecular biology, or cellular biology), and 1–12 hours of advanced engineering or science (at least 3 hours should be 300 level). The remainder of the 72 hours required for a Ph.D. will primarily consist of dissertation research, but may also include seminar and other approved

courses. In addition, students must successfully complete a comprehensive written examination covering basic knowledge in biomedical engineering, pass a qualifying examination consisting of written and oral presentations of a proposal for doctoral research, present a dissertation showing the results of original research in biomedical engineering, and successfully defend the dissertation results in an oral examination.

251–252. Systems Physiology. An introduction to quantitative physiology from the engineering point of view. Descriptive physiology of several organ systems (in particular: heart, lung, kidney, nerve, blood). Mathematical modeling and computer simulation of organ systems and physiologic control mechanisms. Prerequisite: differential equations or permission of instructor. [3–3] Staff.

258. Foundations of Medical Imaging. Physics and engineering of image formation by different modalities used for medical applications. Concepts common to different imaging modalities and limits of physical phenomena. Mathematical concepts of image formation and analysis; techniques for recording images using ionizing radiation (including CT), ultrasound, magnetic resonance, and nuclear (including SPECT and PET). Methods of evaluating image quality. Prerequisite: PHYS 116b, 118b, MATH 196. No credit given for both BME 258 and PHYS 228. SPRING. [3]

263. Signal Measurement and Analysis. (Also listed as Electrical Engineering and Computer Science 263) Discrete time analysis of signals with deterministic and random properties and the effect of linear systems on these properties. Brief review of relevant topics in probability and statistics and introduction to random processes. Discrete Fourier transforms, harmonic and correlation analysis, and correlation analysis, and signal modeling. Implementation of these techniques on a computer is required. Prerequisite: Probability and Statistics. FALL. [3] Does.

271. Biomedical Instrumentation. Introduces methods used to determine physiological functions and variables from the point of view of optimization in the time and frequency domain and the relation to physiological variability. Laboratory exercises stress instrumentation usage and data analysis. Three lectures and one laboratory. Prerequisite: EECE 213, EECE 213L. FALL, SPRING. [4]

272–273. Design of Biomedical Engineering Devices and Systems I and II. Integration of the engineering and life science backgrounds of senior biomedical engineering students through the presentation of design principles for medical devices and systems. Design principles and case examples for biomedical electronics, mechanical, chemical, and computing systems. A full-semester design project is required. Evaluation is conducted through periodic oral and written presentations, a final written and poster report. Corequisite for BME 272: BME 271; prerequisite for BME 272–273: BME 251, BME 252; prerequisite for BME 273: BME 271. [2–3]

274. Principles and Applications of BioMicroElectroMechanical Systems (BioMEMS). Principles, design, fabrication and application of micro- and nano-devices to instrument and control biological molecules, living cells, and small organisms. Development of micro-fabricated systems, lab-on-a-chip, and micro- and nano-biosensors. Topical discussions from the research literature. FALL. [3] Baudenbacher.

275. Therapeutic Bioengineering. Explores the engineering aspects of treating disease or disorders. Surgical mechanics, diffusion therapies including chemical and energy diffusion, image-guided therapies, and the role of discovery and design in the development of medical treatments. Prerequisite: EE 213, BME 101, and BME 210. Corequisite: BME 271. SPRING. [3] Galloway.

276. Biological Basis of Imaging. Physical and chemical relationships between biological characteristics of tissue and image contrast in major medical imaging modalities. Imaging modalities include X-ray, MRI, PET, and ultrasound. Applications include neurological disorders, neurological function, cardiac function and disease, cancer, and musculoskeletal physiology. Prerequisite: 258 or equivalent. SPRING. [3] Does.

277. Quantitative and Functional Imaging. Introduction to quantitative analysis of non-invasive imaging techniques to assess the structure and function of tissues in the body. Computed tomography, positron emission tomography, ultrasound, and magnetic resonance imaging to tissue characterization. Measurement of lesion volume, cardiac output, organ perfusion, brain function and receptor density. Prerequisite: BME 258 and CS 103 or equivalent. FALL. [3] Anderson.

281. Biotechnology. Integration of process bioengineering with cellular and molecular biology to describe the manufacture of products derived from mammalian cells. Optimization of oxygen transport and fluid shear stress in bioreactor design for mammalian cells. Biotechnology ethics. Prerequisite: one year of basic biology (BSci 100 and BSci 201 or BSci 110a and BSci 110b or equivalent) and transport phenomena (BME 210 or ChE 230 or equivalent). SPRING. [3] Giorgio.

282. Biotechnology Laboratory. Laboratory experiments in the culture of mammalian cells in bioreactors. Measurement of cell growth and transgene protein expression as a function of bioreactor conditions. Optimization of oxygen transport and fluid shear stress in bioreactor design for mammalian cells. Corequisite: 281. SPRING. [1] Giorgio.

312. Advanced Biomedical Instrumentation. The scientific bases and design strategies for advanced medical instrument systems. Measurements and diagnosis systems for biomechanical, biochemical, cardiovascular, radiographic, and bioelectric phenomena are discussed. Prerequisite: 271 or consent of instructor. FALL. [3] King.

313. Advanced Biomechanics. Application of advanced concepts in statics, dynamics, continuum mechanics, and strength of materials to biological systems. Topics include measurement of mechanical properties of biological materials; rheological properties of blood; mechanics of cells, bone, skeletal muscle, and soft tissue; normal and abnormal dynamics of human movement; mechanics of articular joint movement; pulmonary mechanics; cardiac mechanics; arterial mechanics; mechanics of veins and collapsible vessels; and mechanics of flow in the microcirculation. Prerequisite: 210 or equivalent. SPRING. [3] Roselli.

314. Bioelectric Signal Processing. The analysis of signals generated by excitable tissues: electrocardiograms, electromyograms, electroencephalograms and others. Course integrates physiological knowledge with an emphasis on mechanisms of signal generation, information in waveforms useful for physiologic investigation and medical diagnosis, and processing methodologies for automatically determining this information. Prerequisite: 263 or permission. SPRING. [3] Staff.

317. Physiological Transport Phenomena. (Also listed as Chemical Engineering 317) The quantitative description of momentum transport (viscous flow) and mass transport (convection and diffusion) in living systems. Prerequisite: courses in fluid dynamics and mass transfer. SPRING. [3] Roselli.

319. Engineering Models of Cellular Phenomena. Application of engineering methods to model and quantify aspects of cell physiology. Topics include receptor mediated cell processes, cell-cell signaling, cooperative barrier behavior, cell structural components, and cell motility. SPRING. [3] Haselton.

320. Laser-Tissue Interaction and Therapeutic Use of Lasers. Optical and thermal aspects and models of the interaction between laser/light and biological tissue as it is used for therapeutic applications in medicine and biology. Issues and objectives in therapeutic and surgical applications of lasers, overview of state-of-the-art topics and current research. FALL. [3] Jansen.

321. Optical Diagnosis: Principles and Applications. Applications of light and tissue optical properties for the diagnosis of tissue pathology. Basic scientific and engineering principles for developing techniques and devices that use light to probe cells and tissues. Recent applications of different optical diagnostic techniques. SPRING. [3] Mahadevan-Jansen.

325. Physical Measurements on Biological Systems. (Also listed as Physics 325) A survey of the state of the art in quantitative physical measurement techniques applied to cellular or molecular physiology. Topics include the basis for generation, measurement, and control of the transmembrane potential; electrochemical instrumentation; optical spectroscopy and imaging; x-ray diffraction for determination of macromolecular structure; magnetic resonance spectroscopy and imaging. One lecture and one recitation. Prerequisite: modern physics course or consent of instructor. SPRING. [3] Wikswo.

329. Advanced Computational Modeling and Analysis in Biomedical Engineering. Current topics in biomedical modeling. Biotransport, biomechanics, cell growth dynamics, and model-based medical imaging. Development of advanced model-based methods for analysis of biomedical systems. SPRING. [3] Miga.

350. Artificial Neural Networks. (Also listed as Computer Science 350 and Electrical Engineering 350) Theory and practice of parallel distributed processing methods using networks of neuron-like computational devices. Neurobiological inspirations, attractor networks, correlational and error-correction learning, regularization, unsupervised learning, reinforcement learning, Bayesian and information theoretic approaches, hardware support, and engineering applications. SPRING. [3] Noelle.

365. Biomedical Pattern Recognition. (Also listed as Electrical Engineering 365) General problems of pattern recognition with applications to biomedical signals and images. Topics such as feature extraction, cluster analysis, discriminant analysis, statistical decision functions, and machine learning will be introduced. Prerequisite: 263 or equivalent. FALL. [3] Staff.

369. Master's Research. [0]

373. Design of Medical Products, Processes, and Services. Medical design projects involving teams of graduate-level engineering and management students. Projects are solicited from industry or universities and are undertaken from the initial phase of a design request to the end product, prototype, plan, or feasibility analysis. Prerequisite: 272. SPRING. [3]

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

389. Master of Engineering Project. Not for M.S. or Ph.D. students. [0]

391–392–393–394. Seminar. Biomedical engineering research seminar. [1–1–1–1]

395. Special Topics. FALL, SPRING. [Variable credit: 1–3]

399. Ph.D. Dissertation Research. [Variable credit: 0–12]

Biomedical Informatics

CHAIR Daniel R. Masys

DIRECTOR OF GRADUATE STUDIES Cynthia S. Gadd

PROFESSORS Mark E. Frisse, Nunzia B. Giuse, Nancy M. Lorenzi, Daniel R. Masys,
Randolph A. Miller, William W. Stead (Primary: Medicine)

ASSOCIATE PROFESSORS Steven H. Brown, Cynthia S. Gadd, Dario A. Giuse,
Paul Harris, Kevin B. Johnson, Edward K. Shultz, Jay R. Snoddy

ASSISTANT PROFESSORS Constantin F. Aliferis, Dominik Aronsky, Eric Boczko,
Joshua C. Denny, William Gregg, Shawn Levy, Bradley Malin, Subramani Mani,
Asli Ozdas, S. Trent Rosenbloom, Jack Starmer, David L. Tabb, Russell Waitman,
Stuart T. Weinberg, Bing Zhang

ADJUNCT ASSISTANT PROFESSOR Ioannis Tsamardinou

INSTRUCTORS Fern Fitzhenry, Rebecca Jerome

DEGREES OFFERED: *Master of Science, Doctor of Philosophy*

✂ BIOMEDICAL informatics studies the structure, discovery, acquisition, integration, management, and optimal use of biomedical information. The field involves multidisciplinary research in all aspects of health care delivery, biomedical research, computational biology, and public health. Biomedical informatics applies, evaluates, and expands results from a variety of disciplines including information and computer science, library science, cognitive science, business management and organization, statistics and biometrics, mathematics, artificial intelligence, operations research, economics, and of course, basic and clinical health sciences. Biomedical informatics has both “knowledge and methods” and “application domain” components. It expands beyond biomedical computer systems design, application, and evaluation to provide theory, tools, and systems that address today’s most urgent challenges in health care delivery, biomedical research, and health professions education.

The curriculum offers concentration areas: Clinical Informatics, the application of informatics to direct patient care, such as advanced decision support and multimedia health records; and Bioinformatics, the application of informatics to support basic research in such areas as genomics, proteomics, and systems biology. Concentrations in development include: Organizational Informatics, the application of informatics to the role of information technology in organizational change; and Clinical Research and Translational Informatics, applications of informatics to facilitating “bench to bedside” translational research.

Students typically enter with a background in one of the health professions (e.g., M.D., R.N., D.D.S., Ph.D. in a health-related area such as psychology or biostatistics), or with a background in computing, engineering, biology, or mathematics. After graduation they pursue careers as full-time academic researchers, part-time academic researchers/part-time clinicians, scientific managers or advanced scientists in industry, information managers in health care settings, consultants or entrepreneurs.

All students take the five core Biomedical Informatics courses: Foundations of Biomedical Informatics, Foundations of Bioinformatics, Methodological Foundations of Biomedical Informatics, Scientific Communication, and Research Rotation in Biomedical Informatics. In addition, M.S. degree students take two selectives; two courses in each of two competency areas (or must have taken the equivalent prior to entrance in the program): computer science, biomedicine, and research methods; and take one additional elective. Ph.D. students take three selectives; two courses in each of three competency areas (or must have taken the equivalent prior to entrance in the program), depending on background; and three additional electives. The curriculum is adapted to students' backgrounds and concentration area. Thus 24–34 formal course credit hours and a thesis are required for the M.S. degree, and a minimum of 72 credits is required for the Ph.D. degree. In addition to earning the M.S. degree, Ph.D. students must pass a qualifying examination and successfully propose and defend a dissertation. A teaching practicum is strongly recommended.

M.D.-M.S., M.D.-Ph.D., and part-time (50 percent) M.S. options are also available for qualified students.

300. Foundations of Biomedical Informatics. This introductory course examines the unique characteristics of clinical and life science data and the methods for representation and transformation of health data, information, and knowledge to improve health care. Principles of information security and confidentiality are taught, along with functional components of information systems in clinical settings and the use of databases for outcome management. Through skill modules, the course provides an introduction to methods underlying many biomedical informatics applications, including information retrieval, medical decision making, evaluation of evidence, and knowledge representation. The historical evaluation of the field of biomedical informatics is taught concurrently, using examples of landmark systems developed by pioneers in the field. FALL. [3] Johnson.

310. Foundations of Bioinformatics. This survey course introduces students to the experimental context and implementation of key algorithms in bioinformatics. The class begins with a review of basic biochemistry and molecular biology. Algorithms for matching, aligning, and comparing biological sequences will be evaluated in the context of molecular evolution. The class will examine the systems developed to enable high-throughput DNA sequencing and genome sequence analysis. The informatics associated with microarrays for the quantitative analysis of transcription will follow. Next, the course will consider the algorithms supporting proteomic mass spectrometry and protein structure inference and prediction. Finally, the class will examine the tools of systems biology, including genetic regulatory networks, gene ontologies, and data integration. Formal training in software development is helpful but not required. Students will write and present individual projects. Undergraduates need the permission of the instructor to enroll. FALL. [3] Tabb.

315. Methodological Foundations of Biomedical Informatics. In this course, students will develop foundational concepts of computation and analytical thinking that are instrumental in solving challenging problems in biomedical informatics. The course will use lectures and projects directed by co-instructors and guest lecturers. SPRING. [3] Aliferis, D. Giuse.

316a–316b. Scientific Communication. The course will enhance students' skills in written and oral scientific communication. An introductory segment covers categories of scientific writing, the peer review process, and ethical issues in research communication. Through a two-semester sequence, it provides direct, hands-on experience in writing papers, abstracts,

and grant proposals; critiquing and copy editing; and preparing and giving presentations for scientific meetings. FALL, SPRING. [1–1] Aronsky, Miller.

318a–318b. Research Rotation in Biomedical Informatics. Students will perform research under the direction of a faculty adviser. FALL, SPRING. [1–1] Staff.

320. Health Care Organization and Management. The purpose of this course is for students to understand the organizational world in which they will spend most of their professional lives. A better understanding will lead to strategies to build partnerships with physicians, researchers, hospitals, and academic organizations. In turn, better understanding will lead to working more closely as a team in planning future directions and implementing technological programs and changes. This course provides an overview of theoretical concepts as well as the practical tools for the student to understand and work effectively with three main topic areas: (1) understanding health care organizations, especially academic health centers; (2) understanding the health care environment; and (3) understanding organizational informatics, including leadership and people issues. SPRING. [3] Lorenzi.

330. Machine Learning for Biomedicine. This course builds on the material covered in Methodological Foundations of Biomedical Informatics (BMIF 315) by introducing several additional machine learning concepts and algorithms with a focus on biomedical decision making and discovery. Even though biomedical applications and examples will be discussed, the methods have broad applicability in science and engineering. The following topics will be covered in this course (may be expanded or modified based on the background of the class participants): decision support systems, cognitive issues in decision making, Bayesian networks, data pre-processing for machine learning, decision trees, clustering, K-Nearest neighbors, neural networks, SVM regression and unsupervised SVMs, Bayesian network learning, and causal discovery using Bayesian networks. Prerequisite: for Biomedical Informatics students, BMIF 315; for non-Biomedical Informatics students, a course in data structures or algorithm design and analysis, the ability to program in MATLAB version 6 or later, and basic concepts of machine learning and fundamental mathematical concepts needed in machine learning at the level covered in BMIF 315. SPRING. [3] Mani, Aliferis.

340. Clinical Information Systems and Databases. This course builds on material covered in Methodological Foundations of Biomedical Informatics (BMIF 315) by introducing and developing concepts in distributed systems and network computing: OSI stack, protocols, TCP/IP, Sockets, and DNS; clinical database concepts: synchronization, concurrency, deadlock, full-text databases; distributed database services, including high-availability techniques; and architectural considerations in the design of clinical information systems. The VUMC clinical database architecture is used as a case study. Prerequisite: for Biomedical Informatics students, BMIF 315 or permission of instructor; for non-Biomedical Informatics students, coding ability in some standard procedural or object-oriented computer language, preferably PERL. FALL. [3] D. Giuse.

360. Graduate Seminar on Biomedical Informatics Algorithms. Graduate-level topics in intermediate or advanced algorithms, data structures, and knowledge representations for biomedical informatics that are not covered in the M.S./Ph.D. core courses. Note: covered topics will be highly dependent on faculty and student interests and will change from year to year to reflect research advances and interests. Students must obtain instructor permission to enter the class. [1–3] (Not currently offered)

369. Master's Thesis Research.

370. Evaluation Methods in Biomedical Informatics. Students are introduced to health information technology evaluation, with exposure to study design, including sampling, appropriate use of controls; data collection, including human subjects research considerations; analysis,

including testing for statistical significance, definitions of sensitivity and specificity, ROC plots; and reporting of results. Quantitative and qualitative methods will be covered, as well as methods and issues specific to health care settings. FALL. [3] Gadd, Peterson, Aronsky.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

380. Data Privacy in Biomedicine. This course introduces students to concepts for evaluating and constructing technologies that protect personal privacy in data collected for primary care and biomedical research. Material in this course touches on topics in biomedical knowledge modeling, data mining, policy design, and law. Prerequisite: Students are expected to be proficient in writing basic software programs, although no specific programming language is required. SPRING. [3] Malin.

391. Special Topics Seminar in Biomedical Informatics. This course is designed for faculty to offer small groups of students a study course on a topic of mutual interest and concern in the faculty member's area of expertise. [3] Staff.

395. Directed Research/Independent Study. Students will work under close supervision of a specific faculty member on an ongoing research problem. Depending on the specific project, students will learn aspects of study design, research methods, data collection and analysis, research manuscript writing, and human factors engineering. SPRING/FALL. [1–3] Staff.

399. Ph.D. Dissertation Research.

Biomedical Sciences

✧ ELEVEN programs participate in this interdisciplinary program: Biochemistry, Biological Sciences, Cancer Biology, Cell and Developmental Biology, Cellular and Molecular Pathology, Chemical and Physical Biology program, Microbiology and Immunology, Molecular Physiology and Biophysics, Neuroscience, Pharmacology, and Human Genetics. During their first year, students take a core curriculum and conduct research in four laboratories before selecting the discipline in which they will earn the Ph.D. degree. Additional course work during subsequent years is appropriate to each discipline and the student's interests.

Ph.D. dissertation research may be conducted in any one of some 200 preceptors' laboratories. Research opportunities are available in the following areas: biotechnology; cancer biology; developmental biology; genetics; growth factors, oncogenes, and antioncogenes; immunology; molecular biology and gene regulation; molecular pathology; molecular toxicology; neurobiology; nutritional biochemistry; reproductive biology; signal transduction; structural biology and molecular biophysics; vascular biology; and viruses and nucleic acids.

299. Fundamentals of Biomedical Research. Overview of basic principles of biomedical research. Course will cover the fundamentals of biochemistry, cell biology, and genetics, the three main components of the fall semester Bioregulation course. SUMMER. [3–6] Chalkley.

300a. Bioregulation I. Fundamental aspects of the utilization of genetic material from DNA to RNA to protein. This includes macromolecular structure and function, cell biology, and the regulation of cell growth. FALL. [6] Patton and Staff.

300b. Bioregulation II. Fundamental aspects of cell-cell communication and information flow through multicellular organs and the overall regulation of these processes. Includes immunologic defense, endocrine signalling, neuroscience, and molecular aspects of disease. SPRING. [Variable credit: 1–6] Patton and Staff.

302. Techniques and Preparations. Eight-week modules conducting laboratory research on a project designed by a faculty preceptor. Includes technical instruction, critical data analysis, experimental design, and literature review. FALL, SPRING. [Variable credit: 1–5] Patton and Staff.

303. Responsible Conduct in Research. Formal lectures and small group discussion on a range of issues encountered in research activities. Included are responsibilities of the investigator and the university to the federal government; scientific misconduct; ethical use of animals in research; ethics of publication, lab management, and grant writing. [0] Patton and Staff.

360. Lab Research.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

399. Ph.D. Dissertation Research.

Biophysics

See Molecular Physiology and Biophysics, Physics and Astronomy

Cancer Biology

CHAIR Lynn M. Matrisian

DIRECTOR OF GRADUATE STUDIES Jin Chen

PROFESSORS Lynn Matrisian, Harold L. Moses, Cathleen C. Pettepher, Vito Quaranta,

Albert B. Reynolds, Ann Richmond

RESEARCH PROFESSOR Oliver McIntyre

ASSOCIATE PROFESSORS Jin Chen, Peng Liang

ASSISTANT PROFESSORS Josiane Eid, Barbara Fingleton, Bo Lu, Alissa Weaver, Fiona Yull

RESEARCH ASSISTANT PROFESSORS Joseph Amann, Lisa McCawley, Shimian Qu,

Robbert Slebos

DEGREES OFFERED: *Master of Science, Doctor of Philosophy*

✚ STUDENTS interested in this program participate in the Interdisciplinary Graduate Program in the Biomedical Sciences during their first year (see Biomedical Sciences). The second year of study comprises a required course in Cancer Biology (342) and electives for a total of at least 24 hours of formal course work toward the Ph.D. degree (including 16 hours in the first year). Additional activities include a weekly Cancer Biology “Science

Hour," an annual Vanderbilt-Ingram Cancer Center Retreat, and an annual Cancer Biology departmental retreat. Most Cancer Biology students participate in the Cancer Biology Student Association (CBSA), which organizes a variety of events each year to enhance the quality of student experience in the Cancer Biology program. A thesis-based master's degree is awarded only under special circumstances.

The program offers focused and comprehensive training in the discipline of cancer biology. Modern cancer research is based on a broad range of technical skills, including molecular biology, cell biology, genetics, biochemistry, and bioinformatics, which the student will learn through course work and laboratory training. Further training includes exercises designed to develop independent thinking, skills in oral and written presentation, analysis of data and information, and dissemination of information through teaching. Thus, the program prepares students with the necessary theoretical and practical skills to succeed in an increasingly wide range of available careers, including academic research, undergraduate teaching, science writing, and basic or applied science in the biotechnology and pharmaceutical industry.

Major research efforts include studies on tumor-stroma interactions, angiogenesis, growth factor and cytokine signaling, oncogenes, tumor suppressors, matrix and matrix degradation, cell adhesion, and metastasis. These studies use state-of-the-art technologies, including all aspects of molecular and cell biology, biochemistry, transgenics, differential display, microarray, and others.

Faculty of the department also participate in interdisciplinary training programs in cancer research supported by the National Cancer Institute of the National Institutes of Health.

320. Cancer and Development. A cross-listed CDB/CB graduate-level course that will examine relationships between cellular responses in normal tissue development and cancer. The goal of the course is to familiarize the students with major cellular pathways and responses that are regulated in normal embryonic and post-natal tissue development and how abnormal re-activation of these responses gives rise to malignant disease. SPRING. [3] deCaestecker.

325. Histology. (Also listed as Cell and Developmental Biology 325 and Cellular and Molecular Pathology 325) This course focuses on the organization of cells to form tissues and organs both in terms of structure and function. Our studies begin with a discussion of the basic tissue types that form all multicellular organisms. Lecture and microscopic laboratory formats will introduce students to epithelia, connective tissue, muscle, nerve, and lymphoid tissues. Students will examine histological preparations microscopically in laboratory during this phase of the course. Next, a discussion of the organization of tissues into functioning organs will be pursued. Here, we will focus on basic concepts in organ arrangement rather than memorizing various structures. Students will have significant input on which adult or developing organs are used as models of organ structure and function. Learning laboratory methods in the analysis of tissues and organs will run concurrently with didactic instruction. Students will be asked to choose specific tissues/organs (often directly related to their thesis work) that they will prepare for morphological analysis. Specifically, students will learn methods in fixation, processing, sectioning, and microscopic analysis including morphometrics, immunofluorescence, histochemistry, and electron microscopy. SUMMER. [3] Bader.

340. Introduction to Cancer Biology. This is a didactic lecture series in which general concepts in cancer biology will be reviewed. Topics range from molecular biology of cancer (oncogene and tumor suppressors) to novel concepts such as cancer stem cells and therapeutic approaches. Prerequisite: IGP core course or consent of instructor. FALL [2] Yull.

342. Advanced Concepts in Cancer Biology. Advanced concepts in cancer biology will be reviewed in depth using a combination of lectures and student-led discussion sessions based on current literature. This course is offered only in tandem with the Introduction to Cancer Biology course to be taken concurrently. Prerequisite: must be a Cancer Biology graduate student or have consent of instructor. FALL. [4] Fingleton.

344. Current Topics in Cancer Biology. A literature-based course covering cancer metastasis. This course focuses on the biology and treatment of malignant disease. Topics vary from year to year. Prerequisite: first-year IGP cancer biology module or permission from instructor. SPRING. [2]

369. Master's Thesis Research.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

399. Ph.D. Dissertation Research. [0–12]

Cell and Developmental Biology

CHAIR Susan R. Wentz

DIRECTOR OF GRADUATE STUDIES Kathleen L. Gould

PROFESSORS Vivien A. Casagrande, Arthur F. Dalley II, Kathleen L. Gould, Steven Hanks, Stephen R. Hann, David M. Miller III, Jeanette Norden, Gary E. Olson, Susan R. Wentz, Christopher V. E. Wright

ASSOCIATE PROFESSOR EMERITUS James McKanna

ASSOCIATE PROFESSORS Chin Chiang, Christopher F. Hardy, Patricia Labosky

ASSISTANT PROFESSORS Byeong J. Cha, Daniela Drummond-Barbosa, Guoqiang Gu, Stacey Huppert, Irina N. Kaverina, Ethan Lee, Laura Lee, Melanie Ohi, Ryoma Ohi, Matthew J. Tyska

DEGREES OFFERED: *Master of Science, Doctor of Philosophy*

✳ GRADUATE study in cell and developmental biology at Vanderbilt emphasizes an interdisciplinary approach to biological research. The department supports strong research programs in the areas of cell proliferation, neurobiology, developmental biology, and reproductive biology; graduate studies in each of these areas may include interdepartmental courses from Cell and Developmental Biology, Biochemistry, Pharmacology, Psychology, Biological Sciences, and Molecular Physiology and Biophysics. Tutorials, seminars, and laboratory rotations foster intellectual interaction between students and faculty. Students are encouraged to begin their research while completing didactic course requirements. During the first year, the student's effort is divided equally between research and course work. Current

research projects focus primarily at the cellular and sub-cellular levels, utilizing biochemical, molecular biological, genetic, cell culture, physiological, and ultrastructural techniques in efforts to correlate structure and function.

310. Cell Biology. A graduate-level course that examines current topics in cell biology, emphasizing relationships between structure and function at the cellular, subcellular, and molecular level. Reviews literature relating to weekly topic(s), which include the cell cycle, signal transduction, transcriptional and post-transcriptional regulation of gene expression, control of cell proliferation, differentiation and development. Develops critical skills, including data interpretation and testing a hypothesis. Prerequisite: IGP curriculum. FALL. [4] Labosky.

312. Introduction to Developmental Biology. This combined lecture and laboratory course will present students with the basics in the analysis of standard animal models used in modern developmental biology. Central concepts in development will be presented in lecture while the student will gain "hands on" training in the growth and care of embryos and analysis of embryonic development in model organisms. Standard methods of analysis (e.g. basic microscopy/morphological analysis, immunolabeling, time-lapse imaging, embryo microinjection) will be presented. Prerequisite: IGP Curriculum. Tuesday/Thursday; Summer Session. [3] Bader, Jessen.

313. Introduction to Modern Biological Microscopy. This lecture course will provide students an introduction to modern microscopy and its biological applications. Topics will include diverse methods of light and electron microscopy, the basic principles of each method, details of specific instrumentation, historical background, advantages and restrictions, as well as applicability to various model systems and organisms. Sample preparation, technical hurdles, tricks of live imaging, micro- and nanomanipulation, quantitative image analysis and other issues will be addressed. The course will also include a tour of microscopy facilities available at Vanderbilt. SPRING. [1] Tyska/Kaverina.

320. Cancer and Development. A cross-listed CDB/CB graduate-level course that will examine relationships between cellular responses in normal tissue development and cancer. The goal of the course is to familiarize the students with major cellular pathways and responses that are regulated in normal embryonic and post-natal tissue development and how abnormal re-activation of these responses gives rise to malignant disease. Offered every other year. SPRING. [3] deCaestecker.

324. Epithelial Pathobiology. To introduce students to issues of polarized epithelial cell function in the context of normal physiology as well as alterations associated with disease. Two one-and-a-half-hour sessions per week, one-semester course; paper presentation and discussion on Wednesday, lecture on Friday. During the course, five visiting scientists from outside Vanderbilt will present special topics changing each year. Prerequisite: open to all graduate students. Offered every other year. SPRING. [3] Goldenring, Coffey.

325. Histology. (Also listed as Cancer Biology 325 and Cellular and Molecular Pathology 325) This course focuses on the organization of cells to form tissues and organs both in terms of structure and function. Our studies begin with a discussion of the basic tissue types that form all multicellular organisms. Lecture and microscopic laboratory formats will introduce students to epithelia, connective tissue, muscle, nerve, and lymphoid tissues. Students will examine histological preparations microscopically in laboratory during this phase of the course. Next, a discussion of the organization of tissues into functioning organs will be pursued. Here, we will focus on basic concepts in organ arrangement rather than memorizing various structures. Students will have significant input on which adult or developing organs are used as models of organ structure and function. Learning laboratory methods in the analysis of tissues and organs will run concurrently with didactic instruction. Students will be asked to choose specific

tissues/organs (often directly related to their thesis work) that they will prepare for morphological analysis. Specifically, students will learn methods in fixation, processing, sectioning, and microscopic analysis including morphometrics, immunofluorescence, histochemistry, and electron microscopy. Offered every other year. FALL. [3] Bader.

330. Seminar in Cell and Developmental Biology. The goal of the course is for graduate students to learn about two cutting-edge areas of research in cell and developmental biology. In spring 2009 the topics will be mechano-biology and epigenetics. Each area will be presented by four outside speakers (eight dates total). The week before each seminar the students will read and discuss, facilitated by a faculty member, a paper authored by the next week's speaker and prepare written critiques. The students will attend the seminar followed by a discussion section with the speaker. FALL, SPRING. [1] Hardy and Staff.

331. Current Topics in Developmental Biology. This course is offered in both the fall and spring semesters and meets once per week to hear a graduate student, postdoctoral fellow or faculty member discuss a research paper from outside his or her field of research, followed by an audience Q&A session. Students taking this course are paired with a PI mentor and together choose a topical scientific paper that the trainee presents at the end of the semester. FALL, SPRING. [1] Wright.

333. Reproductive Biology. A multidisciplinary approach to the study of reproductive biology. Topics covered center on cutting-edge research advances in modern reproductive biology, including: specification of germ cells; cell signaling and the germ line; gonadogenesis and sex determination; meiosis; X-inactivation; germline stem cells; spermatogenesis; oogenesis; fertilization; and implantation. The format will consist of a combination of lectures, faculty-led discussions, and faculty-mentored student presentations. Offered every other year. SPRING. [2] Drummond-Barbosa.

335. Special Topics in Neuroscience. (Also listed as Neuroscience 335 and Psychology 335) Basic issues in neuroscience. Possible topics include neural development, neural plasticity, regeneration, organization and function of cortex, sensory systems, motor systems, and research methodology in neuroscience. A new topic is considered each semester. Prerequisite: 323 or equivalent course, or permission of instructor. [2] (Not currently offered)

337. Molecular Aspects of Cancer Research. (Also listed as Biochemistry 337) A focused series of seminars and discussions to explore the molecular basis of cancer. Seminars rely heavily on extramural speakers with recognized expertise in selected research areas. Students meet with the speaker immediately following each seminar. Discussion sections led by a faculty member follow each series of three to four seminars. SPRING. [1] Carpenter (Biochemistry).

338. Special Topics in Cell Biology. This course is intended to give first-year IGP students a personal perspective on the careers of exceptional cell and developmental biology researchers. Each session will focus on Nobel Prize or Lasker Award winners in Physiology or Medicine that have impacted cell and developmental biology fields. A faculty member with training or interest ties to the researcher will present and lead a discussion on the research topic and the history of the researcher's career. In preparation for each session, the students will research the information at or linked to the award Web sites. For each session, the students will be given a key paper(s) of the winner (or the winner's acceptance speech, or biographical articles, etc. at the discretion of the faculty member). During the class-time interactions with the faculty member, the students will incorporate their perspectives on what they found interesting about the winner's history. For the last wrap-up session, each student will pick an award winner, who has not been discussed, and prepare a 15-minute presentation about that person. SPRING. [Maximum credit: 2] Wentz.

339. Research Seminar in Cell Biology. Students and postdoctoral fellows present their research projects in an informal atmosphere. Students are critiqued on presentations. FALL, SPRING. [1] E. Lee, L. Lee.

340. Special Problems and Experimental Techniques. Designed to allow the student an opportunity to master advanced techniques in cell biology while pursuing special projects under individual members of the faculty in their areas of expertise. Admission to course, hours, and credit by arrangement. FALL, SPRING, SUMMER. [Variable credit: 1–6] Gould.

341. Molecular Developmental Biology. This course comprises three cutting-edge areas of developmental biology per year. The aim of this course is to provide the student with a comprehensive and up-to-date understanding of fundamental issues in modern developmental biology. Faculty didactic lectures provide essential background to facilitate critical reading and discussions of the recent scientific literature. This course is modular, with each module (approximately one month) corresponding to a single thematic topic. Students meet with external lecturers. Topics for 2009 to be selected. SPRING. [Variable credit: 1–3] Wright.

342. Advanced Developmental Biology: Vertebrate Organogenesis. (Also listed as Biological Sciences 342) Cellular and molecular regulation of the morphogenetic processes that shape vertebrate tissues and organs. Emphasis on development of digestive, respiratory, hematopoietic, cardiovascular, urogenital, sensory and nervous systems. Where appropriate, correlation to invertebrate development and reference to evolutionary changes in organ structure and function. [3] (Not currently offered)

345. Cellular and Molecular Neuroscience. (Also listed as Molecular Physiology and Biophysics 345, Neuroscience 345, Pharmacology 345) This course is a required entry-level course for students in the Cell and Molecular Track of the Neuroscience Graduate Program at Vanderbilt that should be taken in the first graduate school year. It also serves as an elective for medical students and graduate students in a number of other programs. Its goal is to expose students to fundamental concepts and techniques in molecular and cellular neuroscience and provide a theoretical context for experimental analysis of brain function and disease. The course is divided into three modules. *Module I: Neural Anatomy and Development* provides an overview of the anatomy of the nervous system and neurotransmitters and examines concepts in neural pattern formation, neuronal migration, axon guidance, and synapse formation. *Module II. Signaling, Plasticity, and Modulation* reviews biophysical and molecular concepts relating to neuronal membrane excitability, secretion, and plasticity. *Module III: Neural Diseases and Disease Models* focuses on specific brain disorders such as epilepsy, pain disorders, Alzheimer's disease, depression, and schizophrenia and current models used to investigate their origin and/or treatment. This course combines faculty lecture with discussion of original articles, with an emphasis on fundamental concepts and the elucidation of important research paradigms in the discipline. Faculty and assistants guide students through important research paradigms with a critical analysis of the primary literature in the topic area. Prerequisite: Bioregulation I (IGP 300A) or consent of instructor. Course directors may consider undergraduate course work in cell biology or biochemistry to meet this requirement. SPRING. [4] Currie, Carter, and Staff.

347. The Visual System. (Also listed as Electrical Engineering 351, Neuroscience 347, Psychology 336) An introduction to the anatomy, physiology, psychophysics, and pathologies of the sense of sight. Physiological optics, retinal anatomy, physiology and neurochemistry, color vision, brain areas involved in visual processing and clinical problems associated with the visual system. SPRING. [3] Casagrande, Bonds (Electrical Engineering), Roe (Psychology).

349. Genetics of Model Organisms. (Also listed as Human Genetics 349, Molecular Physiology and Biophysics 349) Basic genetic principles across a broad range of organisms (yeast, *C. elegans*, *Drosophila melanogaster*, plants, mouse, zebrafish) that are used in genetic analyses to investigate molecular pathways of interest for human disease will be presented. This course will provide students with in-depth terminology and understanding of the advantages, applications, and approaches specific to each organism. Genomic and bioinformatics tools that facilitate genetic analysis in each species will be emphasized. Specific examples of how each model organism has successfully contributed to elucidation of a human disease gene,

pathway, or genetic principle will be presented. Course combines faculty lectures with student presentation and discussion of original articles to emphasize the uniqueness of each model system. Prerequisite: one statistics course at the upper undergraduate level or higher and Fundamentals of Genetic Analysis (MPB 385), or permission of instructor. Offered every other year. SPRING. [3] Southard-Smith and Staff.

350. Cellular Microbiology of the Pathogen-Host Interaction. (Also listed as Microbiology and Immunology 350) An interdisciplinary course designed to train students at the inter face of molecular microbiology and cell biology. Students will be challenged to utilize new information from microbial genome sequencing to understand host cell subcellular compartments and signaling pathways. Prerequisite: A solid background at the graduate or undergraduate level in natural science curriculum, for example, molecular cell biology, microbiology, and immunology. SPRING. [3] Joyce, Skaar.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

399. Ph.D. Dissertation Research.

Cellular and Molecular Pathology

CHAIR Samuel A. Santoro

DIRECTOR OF GRADUATE STUDIES Sarki A. Abdulkadir

PROFESSORS James B. Atkinson III, Paul E. Bock, Raymond F. Burk, Jeffrey Mark Davidson, Sergio Fazio, Agnes B. Fogo, David R. Head, Richard L. Hoover, Billy G. Hudson, Michael Laposata, Barbara O. Meyrick-Clarry, William M. Mitchell, Harold L. Moses, Fritz F. Parl, Samuel A. Santoro, Virginia L. Shepherd, Larry L. Swift, Mary M. Zutter

ASSOCIATE PROFESSORS Sarki A. Abdulkadir, David Gailani, Walter G. Jerome III, Kevin G. Osteen, Gregory C. Sephel, Yi-Wei Tang, William M. Valentine

ASSISTANT PROFESSORS Dorin-Bogdan Borza, James D. Chappell, Christine M. Eischen, Amy S. Major, Claudio A. Mosse, Alissa M. Weaver, Alison L. Woodworth, Pampee Young, Andries Zijlstra

RESEARCH ASSISTANT PROFESSOR Ingrid A. M. Verhamme

DEGREE OFFERED: *Doctor of Philosophy*

✚ STUDENTS interested in this program participate in the Interdisciplinary Graduate Program in the Biomedical Sciences (see Biomedical Sciences). Cellular and molecular pathology occupies a unique place among the biomedical sciences in that it bridges the basic science and clinical disciplines. It seeks to determine the mechanism and etiology of disease, to study the agents and conditions that cause disease, and to elucidate the steps in the transformation of a normal tissue or process into an abnormal one. Pathology is ideally positioned to influence the conceptual and methodologic transfer of advances in the basic biological sciences to the alleviation of disease and the maintenance of health. It uses, therefore, a methodology that encompasses in part the techniques of all other basic and clinical science. Undergraduate majors in biology, chemistry, biochemistry, and molecular biology are appropriate preparation for graduate work in

pathology, which requires a foundation in biochemistry, immunology, molecular genetics, and structural biology.

The program in cellular and molecular pathology leading to the Ph.D. degree is designed to prepare students for careers in biomedical sciences, focusing on research. Students in their first year complete a core of course work through the Interdisciplinary Graduate Program in the Biomedical Sciences (see Biomedical Sciences). The second year of study comprises required and elective courses for a total of at least 24 hours of formal course work (including the 16 hours in the first year). Course selection is tailored to the interests and particular needs of the student, and elective hours are usually taken in areas such as cell biology, biochemistry, molecular biology, and molecular physiology and biophysics. Qualifying examinations are administered after the second year of study, and the final two to three years of the program are devoted to research. A thesis-based master's degree is awarded only under special circumstances.

The research interests of the faculty include vascular biology and biochemistry, tumor pathology, the immune response, inflammation and repair, the biology of the extracellular matrix in response to disease processes, the pathogenesis of infectious agents, and the regulation of gene expression in disease. The department is fully equipped with modern research training facilities and provides close faculty mentoring through a high faculty-to-student ratio.

325. Histology. (Also listed as Cancer Biology 325 and Cell and Developmental Biology 325)

This course focuses on the organization of cells to form tissues and organs both in terms of structure and function. Our studies begin with a discussion of the basic tissue types that form all multicellular organisms. Lecture and microscopic laboratory formats will introduce students to epithelia, connective tissue, muscle, nerve, and lymphoid tissues. Students will examine histological preparations microscopically in laboratory during this phase of the course. Next, a discussion of the organization of tissues into functioning organs will be pursued. Here, we will focus on basic concepts in organ arrangement rather than memorizing various structures. Students will have significant input on which adult or developing organs are used as models of organ structure and function. Learning laboratory methods in the analysis of tissues and organs will run concurrently with didactic instruction. Students will be asked to choose specific tissues/organs (often directly related to their thesis work) that they will prepare for morphological analysis. Specifically, students will learn methods in fixation, processing, sectioning, and microscopic analysis including morphometrics, immunofluorescence, histochemistry, and electron microscopy. SUMMER. [3] Bader.

329. Lipoprotein Metabolism. Lectures, discussions, and assigned readings in the metabolism of plasma lipoproteins. Topics include the composition and structure of plasma lipoproteins; lipoprotein biosynthesis and assembly; enzyme, exchange proteins, and receptors involved in lipoprotein catabolism; and disorders of lipid metabolism. Presentation of oral reports is required. Prerequisite: an introductory course in biochemistry. Minimum enrollment six students. SPRING. [2] Fazio, Linton, Swift.

331. Seminar in Experimental Pathology. Students and faculty participate in a weekly discussion of current research projects and literature. FALL. [1] Hoover and Staff.

332. Current Topics in Experimental Pathology. Students and faculty participate in a weekly discussion of current research projects and literature. SPRING. [1] Hoover and Staff.

333. Fundamentals of Scientific Communication. Focuses on development and enhancement of skills in written and oral scientific communication, and critical thinking in scientific problem solving. Lectures, student projects, presentations, and class discussions emphasizing manuscript and research grant proposal writing, poster and oral presentations. SPRING. [3] Bock, Hoover, and Staff.

335. Molecular Pathology of Extracellular Matrix. Lectures on the structure, genes, metabolism, and regulation of the collagens, structural glycoproteins, proteoglycans, and elastin. The role of these macromolecules in maintaining normal tissue integrity and function and in development and wound healing is emphasized, as is the molecular basis for the involvement of these proteins in both inherited and acquired diseases (e.g., atherosclerosis, diabetes, and cancer). Prerequisite: biochemistry and/or cell biology. SPRING. [2] Davidson, Sephel, and Staff.

337. Cellular and Molecular Basis of Vascular Disease. Lectures on contemporary research in cell biology, protein and lipid biochemistry, and molecular biology of the vascular system. Open to graduate and medical students, postdoctoral fellows, and undergraduate students with consent of instructors and the Graduate School. Prerequisite: a suitable background in biochemistry and cell biology. FALL. [3] Bock, Hoover.

351a–351b. Cellular and Molecular Basis of Disease. An introduction to human disease and the accompanying changes in normal structure and function. The course consists of modules focused on a physiologic system and its related diseases. Each module includes a review of normal anatomy and physiology and the pathological changes occurring with the disease, an in-depth discussion of the molecular and cellular mechanisms of the disease along with clinical correlates, as well as a discussion of high-profile papers relevant to the disease. 351a (Spring) and 351b (Fall) are offered as a series, but they can be taken in any order. Prerequisite: basic knowledge of biochemistry, cell, and molecular biology. [3–3] Abdulkadir, Sephel, and Staff.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

399. Ph.D. Dissertation Research.

Chemical and Biomolecular Engineering

CHAIR Peter N. Pintauro

DIRECTOR OF GRADUATE RECRUITING G. Kane Jennings

DIRECTOR OF GRADUATE PROGRAM Clare McCabe

DIRECTOR OF UNDERGRADUATE PROGRAM Kenneth A. Debelak

PROFESSORS EMERITI Robert J. Bayuzick, Tomlinson Fort, Thomas R. Harris,

John A. Roth, Karl B. Schnelle Jr., Robert D. Tanner

PROFESSORS Peter T. Cummings, Todd D. Giorgio, David S. Kosson, Paul E. Laibinis,

M. Douglas LeVan, K. Arthur Overholser, Peter N. Pintauro, Robert J. Roselli

ASSOCIATE PROFESSORS Kenneth A. Debelak, G. Kane Jennings, Clare McCabe,

Bridget R. Rogers, Sandra J. Rosenthal

ASSOCIATE PROFESSOR OF THE PRACTICE Julie Ervin Sharp

ASSISTANT PROFESSORS Scott A. Guelcher, Jamey D. Young

RESEARCH ASSISTANT PROFESSOR Yongsheng Leng

DEGREES OFFERED: *Master of Science, Doctor of Philosophy*

✦ CHEMICAL engineers play key roles in the development and production of pharmaceuticals and bioengineered materials, high-strength composites and specialty polymers, semiconductors and microelectronic devices, a wide range of ultrapure fine chemicals, and in a variety of other processes. Indeed, chemical and biomolecular engineering is essential for the operation of contemporary society. The solution of many of the problems facing society today—e.g., energy, the environment, development of high-performance materials—will involve chemical engineers.

Graduate work in chemical and biomolecular engineering provides an opportunity for study and research at the cutting edge—to contribute to shaping a new model of what chemical and biomolecular engineering is and what chemical engineers do. Formal course work essentially doubles the exposure to chemical and biomolecular engineering principles that students receive as undergraduates. Thesis research gives unparalleled experience in problem solving, the key to challenging research assignments in industry and admission to the worldwide community of scholars.

All faculty members are active in research and direction of graduate student projects. Current research areas include molecular modeling, materials emphasizing nanotechnology, biochemical engineering and biotechnology, energy and the environment, and adsorption and surface chemistry.

Programs leading to the M.S. and Ph.D. degrees are offered through the Graduate School. Both require a combination of course work and a thesis. The Master of Engineering, an advanced professional degree for engineers, is offered by the School of Engineering. There is no language requirement for any degree.

Candidates for the Master of Science must complete 24 semester hours of graduate-level courses (12 hours in chemical engineering core courses, a 3-hour technology elective from an approved list, and 9 hours in a field complementary to the research). In addition to course work, each degree candidate conducts research under the supervision of a faculty adviser, prepares a written thesis, and presents it orally to the faculty. An M.S. program for non-chemical engineering undergraduates also exists at Vanderbilt. Persons interested in this program should contact the director of the graduate program in the Department of Chemical and Biomolecular Engineering for more detailed information.

Candidates for the Doctor of Philosophy complete a minimum of 72 semester hours of work beyond the bachelor's degree. At least 30 of these hours are course work (21–24 hours in chemical engineering graduate courses including 15 hours in required chemical and biomolecular engineering courses and 6–9 hours in chemical engineering electives). Ph.D. students are required to take at least 6 semester hours outside the department in a related technical field or fields, excluding any courses cross-listed with the department. These courses should complement the student's research interests. The remaining hours are Ph.D. dissertation research. The course load is designed to allow students to spend the majority of their studies on original research. Up to 24 hours of graduate course work with an equivalent of A or B grade may be transferred to Vanderbilt and applied to the

Ph.D. At the end of the first calendar year in residence, students complete a written comprehensive examination on fundamentals that are presented in the chemical and biomolecular engineering core courses and an oral examination on a paper in the field of chemical and biomolecular engineering.

Admission to candidacy in the Ph.D. program is based upon this departmental examination, as well as the Ph.D. qualifying examination, which consists of written and oral presentation of a proposal for doctoral research. Following the examinations and at least 24 semester hours of dissertation research, the student prepares and publicly defends a dissertation presenting results of original research in chemical engineering.

225. Chemical Reaction Engineering. Thermodynamic basis of chemical equilibrium. Analysis of chemical kinetic data and application to the design of chemical reactors. Batch, semibatch, and flow reactors are considered in both steady-state and transient operation. Brief treatments of catalysis and physical and chemical adsorption. Prerequisite: Chem 230 and ChE 223. Graduate credit for nonmajors. FALL. [3]

230. Fluid Mechanics and Heat Transfer. Principles of momentum and energy transport and their application to the analysis and design of chemical and biological engineering systems. Graduate credit for nonmajors. Prerequisite: junior standing. Corequisite: Math 198. FALL. [3]

231. Mass Transfer and Rate-Based Separations. Principles of mass transfer and their application to the analysis of chemical and biological engineering systems. Design of rate-based separation operations. Prerequisite: 230. SPRING. [3]

233W. Chemical Engineering Process Design. A capstone design course for chemical engineering students. A systematic approach to design and safety practices for chemical process operations. Process design, economic evaluation of alternatives, ethics, and a cost and safety analysis of a typical chemical, biological, or petroleum process. Process simulations required. Comprehensive design report required. Prerequisite: senior standing in chemical engineering. SPRING. [4]

234W a–b. Chemical Product Design. An interdisciplinary team-based product design course. Consideration of customer need, product function, product form, technical design, appearance, human interface design, economics, and impact on society. Students experience working with industry on real engineering design problems. Evaluation through periodic oral and written presentations, a final written report, and a poster report. Prerequisite: senior standing. FALL [1], SPRING [3]

242. Chemical Process Control. Design of control systems for chemical processes. Principles of process dynamics and control of single and multivariable systems. Frequency and stability analyses and their effect on controller design. Graduate credit for nonmajors. Prerequisite: Math 198. SPRING. [3]

280. Atmospheric Pollution. (Also listed as Civil Engineering 280) Fundamentals of atmospheric pollution and control. The sources and nature of gaseous and particulate air pollutants, the relation of meteorological conditions to their dispersal, and their effects on health and materials are discussed along with administration, standards, and control of air pollution. FALL. [3]

282. Biochemical Engineering. A course in enzyme catalysis, microbial growth, bioreactor design and analysis and product recovery. Emphasis will be placed on enzyme kinetics and fermentation, process modeling, applications of models to commercial fermentations, biomass plants, and enzyme engineering. For graduate students and advanced undergraduate students. Prerequisite: consent of instructor. [3] (Offered on demand)

283. Bioprocess Engineering. Application of cellular and molecular biology to process engineering to describe the manufacture of products derived from cell cultures. Design and

scale-up of bioreactors and separation equipment. Metabolic and protein engineering utilizing genetically engineered organisms. Prerequisite: BSci 110a, ChE 225, ChE 230. FALL. [3]

284. Semiconductor Materials Processing. Introduction to the materials processing unit operations of silicon device manufacturing. Topics include basic semiconductor physics and device theory, production of substrates, dopant diffusion, ion implantation, thermal oxidation and deposition processes, plasma deposition processes, photolithography, wet chemical and plasma etching, and analytical techniques. FALL. [3]

285. Molecular Simulation. Introduction to the modern tools of statistical mechanics, such as Monte Carlo and molecular dynamics simulation, and variations. Understanding the methods, capabilities, and limitations of molecular simulation and applications to simple and complex fluids relevant to the chemical and related processing industries. Prerequisite: 162, 180, and 223. [3] McCabe and Staff.

286. Molecular Aspects of Chemical Engineering. Integration of molecular chemistry, property-based thermodynamic descriptions, and a focus on intermolecular energetics for process analysis and product design. Case studies involve molecular, macromolecular, supramolecular, and biomolecular systems. Prerequisite: Chem 220a and ChE 162 or equivalents. [3] Laibinis, Jennings.

287. Polymer Science and Engineering. Macromolecular systems with emphasis on the interrelationship of chemical, physical, and engineering properties. Further relation of these properties to synthesis. Physicochemical and biological applications. Prerequisite: 162, a basic understanding of organic and physical chemistry. [3]

290. Special Topics in Chemical Engineering. For beginning graduate and advanced undergraduate students. New areas and technology of interest to faculty and students in chemical engineering. Prerequisite: consent of instructor. FALL. [3]

297. Senior Engineering Design Seminar Elements of professional engineering practice. Professionalism, licensing, ethics and ethical issues, intellectual property, contracts, liability, risk, reliability and safety, interdisciplinary teams and team tools, codes, standards, professional organizations, careers, entrepreneurship, human factors, and industrial design. Prerequisite: senior standing. FALL. [1]

310. Applied Mathematics in Chemical Engineering. Chemical engineering applications of advanced mathematical methods. Analytical and numerical methods for ordinary and partial differential equations. Emphasis on recognizing the form of a mathematical model and possible solution methods. Applications in heat and mass transfer, chemical kinetics. FALL. [3]

311. Advanced Chemical Engineering Thermodynamics. Application of the thermodynamics method to chemical engineering problems. Development of the first, second, and third laws of thermodynamics; estimation and correlation of thermodynamic properties; chemical and phase equilibria; irreversible thermodynamics. [3]

312. Transport Phenomena. The theory of nonequilibrium processes. Development of the analogy between momentum, energy, and mass transport, with applications to common engineering problems. SPRING. [3]

313. Applied Chemical Kinetics. Experimental methods in kinetics. Kinetics of industrial reactions and reactor design. Adsorption and catalytic systems are considered. FALL. [3]

315. Systems Analysis for Process Design and Control. The design and control of chemical process plants, including economic optimization under steady state and transient conditions. [3]

317. Physiological Transport Phenomena. (Also listed as Biomedical Engineering 317) The quantitative description of momentum transport (viscous flow) and mass transport

(convection and diffusion) in living systems. Prerequisite: courses in fluid dynamics and mass transfer. [3] (Offered on demand)

320. Surfaces and Adsorption. Surface energy, capillarity, contact angles and wetting, surface films, insoluble monolayers, solid surfaces, membranes, surface area determination, adsorption, adhesion, interface thermodynamics, friction and lubrication, interfaces in composites, relationships of surface to bulk properties of materials. [3] (Offered on demand)

328. Chemical Engineering Simulation. Modeling and simulation of chemical engineering systems using numerical methods applied to the solutions of multiscale linear and non-linear systems of equations, and ordinary and partial differential equations. FALL. [3]

369. Master's Thesis Research. [0]

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

389. Master of Engineering Project. Not for M.S. or Ph.D. students. [0]

397. Special Topics. FALL. [3]

398. Seminar. [0]

399. Ph.D. Dissertation Research.

Chemical and Physical Biology

Admissions Program for Chemical and Physical Biology

The CPB Program is an inter departmental umbrella graduate program seeking students who have earned undergraduate degrees in the quantitative and/or physical sciences (e.g., chemistry, computer science, engineering, mathematics, or physics) who wish to pursue a doctoral degree at the interface of the chemical, physical, and biological sciences. The curriculum prepares students for research careers at the chemistry-biology interface, in structural biology, in molecular biophysics, or in computational biology. Research opportunities are available in a broad range of areas including: biological mass spectroscopy, biomagnetics and nonlinear dynamics, computational biology and molecular modeling, protein-protein interactions, NMR and EPR, cryo-Electron Microscopy, chemical biology, fluorescence spectroscopy and microscopy, protein-nucleic acid interactions, structural biology, nanocrystals, macromolecular structure and dynamics, mechanistic enzymology, proteomics, molecular toxicology, and mathematical modeling of biological systems.

In the first year, students will complete three laboratory rotations of their choice as well as take courses related to their interests. Following the completion of the first year, students may choose to earn their Ph.D. degree in any of the eleven departmentally based Ph.D. degree programs or alternatively in three non-departmentally based Ph.D. degree programs, which are Chemical and Physical Biology, Human Genetics, and Molecular Neuroscience. Participating departments are Biochemistry,

Biological Sciences, Cancer Biology, Cell and Developmental Biology, Chemistry, Microbiology and Immunology, Mathematics, Molecular Physiology and Biophysics, Pathology, Pharmacology, and Physics.

Ph.D. Training Program in Chemical and Physical Biology

The Ph.D. degree in chemical and physical biology is available to all students who enter the transinstitutional CPB or IGP graduate admissions program or any of the departmentally based graduate programs. The Ph.D. training program is designed to provide rigorous integrated training at the interface of the chemical and/or physical sciences and the biological sciences. The course work and research components of the program prepare students for research careers in which they are able to bring state-of-the-art tools of the modern chemical and physical sciences to bear on cutting-edge biological problems.

302. Techniques and Preparation. FALL, SPRING, SUMMER. [1–5] Beth.

303. Responsible Conduct in Research I and II. Formal lectures and small group discussion on a range of issues encountered in research activities. Included are responsibilities of the investigator and the university to the federal government; scientific misconduct; ethical use of animals in research; ethics of publication, lab management, and grant writing. [0] Chalkley and Staff.

310. Graduate Seminar in Chemical Biology. FALL. [1] Marnett.

349. Graduate Seminar in Molecular Biophysics. SPRING. [1] Chazin.

350. Independent Study. FALL, SPRING, SUMMER. [1–6] TBA

360. Laboratory Research. FALL, SPRING, SUMMER. [1–12] TBA

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. FALL, SPRING, SUMMER. [0–12]

399. Ph.D. Dissertation Research. FALL, SPRING, SUMMER. [0–12] TBA

Chemistry

CHAIR Ned A. Porter

DIRECTOR OF UNDERGRADUATE STUDIES Adam K. List

DIRECTOR OF GRADUATE STUDIES Charles M. Lukehart

PROFESSORS EMERITI Robert V. Dilts, Larry C. Hall, Thomas M. Harris, David M. Hercules,

Melvin D. Joesten, Mark M. Jones, Lawrence J. Schaad, David L. Tuleen, David J. Wilson

PROFESSORS Richard N. Armstrong, Darryl J. Bornhop, Richard M. Caprioli, Walter J.

Chazin, David L. Hachey, Timothy P. Hanusa, B. Andes Hess Jr., Jeffrey N. Johnston,

Charles M. Lukehart, Terry P. Lybrand, Lawrence J. Marnett, Hassane S. Mchaourab,

Prasad L. Polavarapu, Ned A. Porter, Carmelo J. Rizzo, Sandra J. Rosenthal, Michael P.

Stone, Gary A. Sulikowski, Joel Tellinghuisen

RESEARCH PROFESSORS Thomas M. Harris, David M. Hercules

ADJOINT PROFESSOR Lidia Smentek

ASSOCIATE PROFESSORS H. Alex Brown, David E. Cliffler, Piotr Kaszynski, Craig W. Lindsley, Clare McCabe, David W. Wright
ADJUNCT ASSOCIATE PROFESSOR Norma K. Dunlap
ASSISTANT PROFESSORS Brian O. Bachmann, Eva M. Harth, John A. McLean, Jens Meiler
RESEARCH ASSISTANT PROFESSORS Madalina Ciobanu, Anthony P. Gies, Hye-Young Kim, Dmitry Koktysh, Ivan Kozekov, James R. McBride, Donald F. Stec, Keri A. Tallman, Ian D. Tomlinson, Markus W. Voehler, Huiyong Yin
ADJOINT ASSISTANT PROFESSOR Andrienne C. Friedli
SENIOR LECTURERS Adam K. List, Shawn T. Phillips, Michelle M. Sulikowski, Grace R. Zoorob
LECTURER Tara D. Todd

DEGREES OFFERED: *Master of Arts in Teaching, Master of Science, Doctor of Philosophy*

✂ RESEARCH programs are offered in the traditional areas of analytical, inorganic, organic, and physical chemistry along with interdisciplinary research programs in biological, environmental, and materials chemistry and chemical physics. A wide range of research projects are under active investigation and are supported by excellent research facilities, modern instrumentation, and external funding.

A research thesis is required for a master's degree. Specific requirements for the Ph.D. degree are defined in a Ph.D. program document that is available upon request from the Department of Chemistry. Both the master's and Ph.D. degrees require a minimum of 24 hours of formal course work.

202. Introduction to Bioinorganic Chemistry. Functions of inorganic elements in living cells. The manner in which coordination can modify the properties of metallic ions in living systems. Non-metallic elements including selenium, iodine, chlorine, and phosphorus. Prerequisite: 220a–220b. SPRING. [3] Wright.

203. Inorganic Chemistry. A survey of modern inorganic chemistry including coordination compounds and the compounds of the main-group elements. Representative reactions and current theories are treated. Prerequisite: organic and physical chemistry. FALL. [3] Wright.

204. Inorganic Preparations. Synthesis and characterization of inorganic compounds or materials; one laboratory per week. Pre- or corequisite: 203. SPRING. [1] Todd.

207. Introduction to Organometallic Chemistry. A general description of the preparation, reaction chemistry, molecular structure, bonding, and spectroscopic identification of organometallic compounds of the transition metals. Prerequisite: 203, 220a–220b. [3] Lukehart. (Not currently offered)

210. Introduction to Analytical Chemistry. Fundamental quantitative analytical chemistry with emphasis on principles of analysis, separations, equilibria, stoichiometry and spectrophotometry. No credit for graduate students in chemistry. Must be accompanied by 212a. SPRING. [3] McLean.

211. Instrumental Analytical Chemistry. Chemical and physical principles of modern analytical chemistry instrumentation. Credit allowed for chemistry graduate students having deficiency. Prerequisite: 210, 220a–220b, and 230. Must be accompanied by 212b for undergraduates. FALL. [3] Cliffler.

212a–212b. Analytical Chemistry Laboratory. Laboratory to accompany Chemistry 210 (212a) and 211 (212b). No credit for graduate students in chemistry. Corequisite: 210–211. One four-hour laboratory per week. [1–1] Zoorob.

219a–219b. Organic Chemistry Laboratory. Laboratory to accompany 220a–220b. Corequisite: 220a–220b. One four-hour laboratory per week. [1–1] List.

220a–220b. Organic Chemistry. Fundamental types of organic compounds, their nomenclature, classification, preparations, reactions and general application. Prerequisite: 102a–102b, 103a–103b, 104a–104b. No credit for graduate students in chemistry. Ordinarily accompanied by 219a–219b. [3–3] M. Sulikowski, Johnston, G. Sulikowski.

220c. Organic Chemistry Structure and Mechanism. Introduction to advanced topics in organic chemistry. Stereochemistry and conformational analysis, mechanisms of organic reactions, linear free-energy relationships, reactive intermediates. Three lectures and one recitation hour per week. FALL. [4] N. Porter, Johnston.

221. Laboratory Techniques in Organic Chemistry. Advanced work in organic preparations, new synthetic techniques, and modern organic analytical methods, including infrared and nuclear magnetic resonance. Prerequisite: 220b. One lecture and two laboratory periods per week. [3] (Not currently offered)

222. Physical Organic Chemistry. Structure and bonding in organic molecules. Reactive intermediates and organic reaction mechanisms. Prerequisite: 220b, 231. SPRING. [3] Kaszynski.

223. Advanced Organic Reactions. A comprehensive study of the synthesis and behavior of organic compounds based on electronic theory. Prerequisite: 220a–220b and 221, 230, 231, 236, and 237, or special consent of instructor. Three lectures per week. SPRING. [3] G. Sulikowski.

224. Bioorganic Chemistry. Essential metabolites including vitamins, steroids, peptides, and nucleotides. Consideration of phosphate esters and the synthesis of oligodeoxynucleotides. Prerequisite: 220a–220b. Three lectures per week. FALL. [3] Rizzo.

225. Spectroscopic Identification of Organic Compounds. Theoretical and practical aspects of spectroscopic methods, with an emphasis on NMR spectroscopy, for structural characterization of organic compounds. Prerequisite: 220b. FALL. [3] Bachmann.

226. Medicinal Chemistry. Drug design and development; physical chemistry of drug interactions with receptors, enzymes, and DNA; drug absorption and distribution. Organic chemistry of drug metabolism; mechanism of action for selected therapeutic classes. Prerequisite: 224 or BSCI 220. FALL. [3] Lybrand.

230. Physical Chemistry I. Chemical kinetics and principles of quantum chemistry applied to molecular structure, bonding, and spectroscopy. Prerequisite: Math 150a–150b or Math 155a–155b and Physics 116a–116b or Physics 117a–117b. No credit for graduate students in chemistry. FALL. [3] Rosenthal.

231. Physical Chemistry II. Chemical thermodynamics and equilibrium, their statistical foundation, and applications to chemical phenomena. Prerequisite: Math 150a–150b or Math 155a–155b and Physics 116a–116b or Physics 117a–117b. No credit for graduate students in chemistry. SPRING. [3] Meiler.

232. Quantum Chemistry. Limits of classical mechanics at the atomic and molecular level; the postulates of quantum mechanics applied to problems in one, two, and three dimensions; perturbation and other methods. Prerequisite: 231 or equivalent. FALL. [3] Stone.

233. Molecular Modeling Methods. Introduction to theory and practice of computer simulation studies of molecules with emphasis on applications to biological molecules and complexes. Discussion of background theory, implementation details, capabilities and practical limitations of these methods. Prerequisite: 231. Three lectures and one three-hour laboratory per week. SPRING. [4] Lybrand.

234. Spectroscopy. Experimental and theoretical aspects of spectroscopy. Energy levels, selection rules, and spectral transitions as related to atomic and molecular structure. Design of contemporary magnetic resonance and optical spectroscopy measurements. Prerequisite: 231. SPRING. [3] Stone.

235. Surface and Polymer Chemistry. An introduction to the physics and chemistry of surface phenomena and of colloidal and macromolecular systems. Applications of thermodynamic, kinetic, and spectroscopic principles to the study of phase boundary problems in chemistry. Prerequisite: 230 or consent of instructor. FALL. [3] Harth.

236. Physical Chemistry Laboratory. Experiments in chemical thermodynamics and kinetics. Data analysis and presentation. No credit for graduate students in chemistry. One three-hour laboratory or one lecture per week. Prerequisite: calculus through Math 175 recommended. FALL. [1] Tellinghuisen.

237. Experimental Spectroscopy. Experiments in ultraviolet, visible, infrared, and Raman spectroscopy of atoms and molecules, with application to lasers, photochemistry, and kinetics. Data analysis and presentation. No credit for graduate students in chemistry. One three-hour laboratory and one lecture per week. Prerequisite: 230 and 236; Math 175. SPRING. [2] Tellinghuisen.

238. Computational Structural Biochemistry. Theoretical and practical aspects of modeling protein structure and interactions computationally. Sequence-sequence alignments, secondary structure prediction, fold recognition, de novo structure prediction. Protein design, protein-protein docking, protein-ligand docking. Prerequisite: 231. FALL. [4] Meiler.

250. Chemical Literature. Assigned readings and problems in the nature and use of the chemical literature. Prerequisite: one year of organic chemistry. SPRING. [1] K. Porter.

301a–301b. Chemistry Seminar. [1–1] Lukehart, Rizzo.

304. Special Topics in Inorganic Chemistry. SPRING. [3] (Offered on demand)

306. Physical Methods in Inorganic Chemistry. Application of spectroscopic methods to inorganic chemistry. Discussion of symmetry and group theory as required for the use of spectroscopic methods is also included. SPRING. [3] (Offered on demand)

311. Advanced Analytical Chemistry I. Analytical spectroscopy, mass spectrometry, design and analysis of experiments. FALL. [3] McLean.

312. Electrochemistry: Theory and Analysis. SPRING. [3] Cliffl.

313. Advanced Analytical Chemistry II. Signal processing, separation science, and electrochemical methods. SPRING. [3] Bornhop.

314a–314b. Special Topics in Analytical Chemistry. 314a: FALL. [3] Staff.

315. Separation Methods: A Practical Approach. Theories of separation science; distillation, capillary electrophoresis, membrane separation, and supercritical fluid extraction; emphasis on chromatography. FALL. [3] Bornhop.

316. Problem Solving in Analytical Chemistry. Application of analytical reasoning and methodology development to the design and completion of an experimental laboratory project. SPRING. [3] Staff.

324. Special Topics in Organic Chemistry. SPRING. [3] Staff.

326. Readings in Organic Chemistry. Current topics in organic literature. May be repeated for a total credit of 3 hours. Prerequisite: 222 or 223. [1–1] Organic chemistry faculty.

330. Advanced Quantum Chemistry. Advanced topics in the application of quantum mechanics to chemical bonding and spectroscopy. Prerequisite: 232. SPRING. [3] Staff.

331. Statistical Thermodynamics. Statistical mechanics and chemical equilibrium; distribution laws, partition functions, and thermodynamic properties of atoms and molecules; applications to gases, liquids, and solids. Prerequisite: 232. [3] Staff.

332. Special Topics in Chemical Physics. FALL, SPRING. [3] Staff.

335. Thermodynamics and Kinetics of Inorganic and Organic Materials. Equilibrium in chemical and physical processes of ideal and real systems. Reaction rates for elementary mechanisms. Credit not given for both 335 and 230 or 231. [3] Staff.

336. Biochemical Toxicology and Carcinogenesis. (Also listed as Biochemistry 336) Chemical and biological aspects of toxicology and carcinogenesis, including basic principles and mechanisms, metabolism and enzymology, molecular biology, chemistry of reactive intermediates, and a survey of several classes of environmentally important compounds. Prerequisite: a course in general biochemistry or consent of instructor. Three lectures per week. FALL. [3] Guengerich (Biochemistry) and Staff.

340. Applications of Group Theory. Molecular symmetry, point groups, and character tables. Application to molecular orbitals, vibrational spectra, or organic and inorganic systems. SPRING. [3] Staff.

350. Materials Chemistry. A survey of modern materials chemistry with an emphasis on the chemistry related to the preparation, processing, identification, analysis, and applications of materials. FALL. [3] Harth.

360. Practicum in Chemistry Instruction. Preparation for and the teaching of chemistry to undergraduate students. No credit for chemistry graduate students. FALL, SPRING. [0] List.

369. Master's Thesis Research.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

380. Introduction to Research. Introduction to chemical research under the guidance of individual faculty members. Students participate in three rotations among faculty research groups and provide graded work. For chemistry graduate students only. FALL, SPRING, SUMMER. [1–2] Lukehart.

385. Advanced Reading in Chemistry. Specialized topics under the guidance of a departmental faculty member. Open to qualified graduate students only. FALL, SPRING. [3] Porter.

399. Ph.D. Dissertation Research.

Chinese

CHINESE LANGUAGE PROGRAM COORDINATOR Xianmin Liu

SENIOR LECTURER Xianmin Liu

LECTURERS Jing Liu, Qing Wei

✂ **COURSES in Chinese** are available for minor credit in master's degree programs only. Students should consult their advisers about the acceptability of the courses as related work.

201–202. Elementary Chinese. Introduction to modern Chinese pronunciation, grammar, conversation, reading, and writing. [5–5] Liu, Wei.

214–216. Intermediate Chinese. Language training in oral and written Chinese. Prerequisite: 201–202. [5–5] Liu, Wei.

231. Calligraphy. Basic skills of writing standard script *kaishu*. Basic aesthetic of Chinese calligraphy. No Chinese language background necessary. [1] Liu.

241–242. Advanced Chinese. Readings in Chinese culture to enhance proficiency in oral and written Chinese. Prerequisite: 214–216. [3–3]

251–252. China Today. Selected readings from books, newspapers, Internet, TV, etc. pertaining to today's political, social, and economic issues in China, including foreign trade-related issues. Extensive discussions, presentations, and oral/written assignments to further develop students' overall communication skills. Prerequisite: 241–242 or consent of instructor. [3–3] Liu.

255–256. Business Chinese. Language skills for listening, speaking, reading, and writing in business environments. Modern China from economic and business perspectives. Prerequisite: 242. FALL, SPRING. [3–3] Liu.

289a–289b. Independent Study. A reading course, the content of which varies according to the need of the individual student. Primarily designed to cover pertinent material not otherwise available to the student in the regular curriculum. [Variable credit: 1–3] Liu.

Civil Engineering

CHAIR David S. Kosson

DIRECTOR OF GRADUATE STUDIES Prodyot K. Basu

PROFESSORS EMERITI Paul Harrawood, Peter G. Hoadley, Richard E. Speece,
Edward L. Thackston

PROFESSORS Mark D. Abkowitz, Prodyot K. Basu, David S. Kosson, Sankaran Mahadevan,
Frank L. Parker

RESEARCH PROFESSOR Malcolm E. Baird

PROFESSORS OF THE PRACTICE James H. Clarke, Sanjiv Gokhale

ASSOCIATE PROFESSORS Alan R. Bowers, Eugene J. LeBoeuf, Robert E. Stammer Jr.

ASSOCIATE PROFESSOR OF THE PRACTICE John R. Veillette

ASSISTANT PROFESSORS Mark P. McDonald, Caglar Oskay, Florence Sanchez,
Lori Troxel, Luoyu (Roy) Xu

RESEARCH ASSISTANT PROFESSORS Edsel Daniel, James R. Dobbins,
 Andrew C. Garrabrants, Leslie Shor
 ADJUNCT PROFESSORS Curtis Byers, Gregory Cashion, Vic McConnell

DEGREES OFFERED: *Master of Science, Doctor of Philosophy*

✦ DEGREE programs at the M.S. and Ph.D. level are offered in structural engineering, structural mechanics, and transportation engineering, and at the M.S. level in construction management. M.S. and Ph.D. programs in environmental engineering are offered by the graduate program in that subject.

The Ph.D. requires a minimum of 36 hours of formal course work and a dissertation. The M.S. degree has two options: (1) 24 hours of graduate-level course work and a research thesis, or (2) 30 hours of graduate-level course work.

The Master of Engineering degree, an advanced professional degree for engineers, is offered by the School of Engineering.

251. Foundation Analysis and Design. Shallow and deep foundation elements and systems for civil engineering structures. Soil exploration and site investigation. Prerequisite: 240 or equivalent. SPRING. [3]

252a–252b. Civil and Environmental Engineering Seminar. A two-part seminar series designed to introduce students to current technical and professional issues through literature discussions, seminars by faculty and practicing engineers, and participation in panel discussions. Prerequisite: senior or graduate standing or consent of instructor. FALL, SPRING. [1–1] Staff.

255. Transportation System Design. The geometric analysis of transportation ways, with particular emphasis on horizontal and vertical alignment. Design of highways, interchanges, intersections, and facilities for air, rail, and public transportation. Prerequisite: 225, Transportation Systems Engineering. SPRING. [3] Stammer.

256. Urban Transportation Planning. Analytical methods and the decision-making process. Transportation studies, travel characteristic analyses, and land-use implications applied to surface transportation systems. Emphasis on trip generation, trip distribution, modal split, and traffic assignment. Computerized planning programs are used. Prerequisite: 225, Transportation Systems Engineering. SPRING. [3] Staff.

257. Traffic Engineering. Analysis of the characteristics of traffic, including the driver, vehicles, volumes, speeds, capacities, roadway conditions, and accidents. Traffic regulation, control, signing, signalization, and safety programs are also discussed. Prerequisite: 225, Transportation Systems Engineering. FALL. [3] Stammer.

259. Geographic Information Systems. Principles of computerized geographic information systems (GIS) and analytical use of spatial information. Integration with global positioning systems (GPS) and Internet delivery. GIS software utilization and individual projects. SPRING. [3] Staff.

262. Intelligent Transportation Systems. Elements of intelligent transportation system (ITS) architecture. Survey of component systems. Analysis of potential impacts. Field operational tests, analysis methods, deployment initiatives and results. Prerequisite: 257 or graduate standing. SPRING. [3] Staff.

286. Construction Project Management. Introduction to the theory and application of the fundamentals of construction project management. The construction process and the roles

of professionals in the process. Broad overview of the construction project from conception through completion. Application of management practices including planning, directing, cost minimizing, resource allocation, and control of all aspects of construction operations and resources. Prerequisite: CE 235 or consent of instructor. FALL. [3] Gokhale.

287. Construction Estimation. Fundamentals of construction estimating. Estimation of material, labor, and equipment quantities, including costing and pricing of projects. Application of estimating practices using real-world examples and project estimating software. Corequisite: 286. FALL. [3] Gokhale.

288. Construction Planning. Fundamentals of construction planning and scheduling. Application of management practices including process planning; directing, costing; resource allocation; and controlling all aspects of construction operations and resources, from pre-construction through operation and maintenance. Use of real-world examples and project scheduling software. Prerequisite: 286 and 287. SPRING. [3] Gokhale.

290. Reliability and Risk Case Studies. Review of case studies involving successes and failures in managing reliability and risk assessment of engineering systems from a wide range of perspectives, including design, production, operations, organizational culture, human factors, and exogenous events. Analysis of event consequences in terms of public health and safety, the environment and business continuity, and the implications on regulation, legal liability, and business practices. Evaluation of mitigation strategies based on achievable goals, technical and political feasibility, and economic impact. Cases drawn from natural disasters, industrial accidents, and intentional acts. Prerequisite: junior standing or consent of instructor. FALL. [3] Abkowitz.

291. Construction Materials and Methods. Implications of design realities, material specifications, code limitations, and regulations on the construction process. Natural and man-made materials, construction techniques, and other issues that impact quality, constructability, and life-cycle assessment. Prerequisite: senior standing. SUMMER. [3]

292. Construction Law and Contracts. Review of case studies involving successes and failures in legal principles and landmark cases relevant to civil engineering and construction. Contracts, torts, agency and professional liability, labor laws, insurance, expert testimony, arbitration, patents and copyrights, sureties, and ethics. Prerequisite: 286. SPRING. [3] Staff.

293. Advanced Structural Steel Design. Advanced topics in column and beam design including local buckling, composite beams, plate girders, and torsion design. Behavior and design of bolted and welded connections. Structural planning and design of structural systems like multistory buildings including computer applications. Prerequisite: 235. FALL. [3] Troxel.

294. Advanced Reinforced-Concrete Design. Design and behavior of two-way slab systems. Yield-line theory. Shear and torsion analysis and design. Serviceability requirements and control of deflections of reinforced-concrete systems. Introduction to prestressed concrete. Prerequisite: 235. SPRING. [3] Troxel.

295. Mechanics of Composite Materials. Review of constituent materials (reinforcements, matrices, and interfaces) and fabrication processes. Prediction of properties of unidirectional and short fiber materials (micromechanics). Anisotropic elasticity (derivation of Hooke's law for anisotropic materials, macromechanics of laminated composites). Analysis of laminated composites based on Classical Lamination Theory. Behavior of composite beams and plates. Special topics (creep, fracture, fatigue, impact, and environmental effects). Prerequisite: 182 and MSE 150. SPRING. [3] Staff.

299. Special Topics. Special topics of interest to staff and students based on departmental research or current developments in civil engineering. FALL, SPRING. [3] Staff.

301. Advanced Mechanics of Solids I. Stress and strain analysis: equilibrium, compatibility, and constitutive equations including linear elastic and thermo-elastic relations; transformations; octahedral and deviatoric stresses. Applications to the torsion of bars, stress concentrations, and semi-infinite medium problems. Euler-Bernoulli and Timoshenko beam theories. Energy and related methods including applications. Kirchoff's bending of rectangular and circular plates. Prerequisite: 182 or equivalent, Math 198 or equivalent, Math 194 or equivalent, or consent of instructor. FALL. [3] Xu.

302. Advanced Mechanics of Solids II. Modes of failure: creep and relaxation, plastic flow, fracture and fatigue. Stability of members, frames, and plates. Membrane and bending analyses of shells, including the beam on elastic foundation analogy for cylindrical shells. Inelastic behavior and plasticity including frame, planar, axis-symmetric, and slip line problems. Prerequisite: 301 or consent of instructor. SPRING. [3] Xu.

307. Finite Element Analysis. Discrete modeling of problems of the continua. Mathematical basis of finite element method-weighted residual and variational concepts. Finite element formulations-displacement, force, and mixed methods. One-D problems of the continua and finite element solution-C0 and C1 elements, eigenvalue and transient problems. Error checks and control. Mapping, shape functions, numerical quadrature, and solution of equations. Finite element formulation of two-dimensional problems (single and multi-field)-mapping and shape functions, triangular and quad elements with straight or curved boundaries. Application problems in 1-D, 2-D and 3-D. Three-D elements, singular problems, and elements of buckling and nonlinear problems. Error estimation and quality control. Computer implementation. Commercial packages. Prerequisite: Math 194 and Math 226 or equivalent, or consent of instructor. FALL. [3] Park.

308. Advanced Computational Mechanics. Basics of nonlinear mechanics—geometric and material nonlinearities. Discrete Lagrangian, Eulerian, and other formulations. Nonlinear material models. Numerical solution algorithms in space and time. Solution of nonlinear problems. Multidisciplinary problems. Error estimation and adaptive model improvement. Multiscale modeling and atomistic/continuum coupling. Prerequisite: 307 or equivalent. SPRING. [3] Staff.

309. Structural Dynamics and Control. Analysis of single- and multi-degree-of-freedom systems. Modal superposition method. Time and frequency domain analyses. Numerical methods and introduction to nonlinear dynamic analysis. Applications to structures subject to earthquake and impact forces. Elements of feedback control systems. Control of lumped parameter systems. Active, passive, and hybrid mass dampers. Application to simple building and bridge structures. SPRING. [3] Basu.

310. Probabilistic Models in Engineering Design. (Also listed as MT 312) Applications of probabilistic models in the analysis and synthesis of engineering systems. Review of basic probability concepts, random variables and distributions, modeling and quantification of uncertainty, testing the validity of assumed models, linear regression and correlation analyses, Monte Carlo simulation, reliability analysis and reliability-based design. Emphasis on applications in civil, mechanical, and chemical engineering. Prerequisite: Math 230 or consent of instructor. FALL. [3] Mahadevan.

311. Engineering Design Optimization. Methods for optimal design of engineering systems. Optimization under uncertainty, reliability-based design optimization, robust design, multidisciplinary problems, multi-objective optimization. Discrete and continuous design variables, advanced numerical algorithms, and formulations and strategies for computational efficiency. Practical applications and term projects in the student's area of interest. Prerequisite: Math 287, Math 288 or CS 257, CE 310. [3] (Offered on demand)

313. Advanced Reliability Methods. Computational methods for probabilistic analysis and design of modern engineering systems. Emphasis on system reliability, nonlinear reliability

methods, Weibull analysis, Bayesian methods, response surface modeling and design of experiments, advanced simulation and variance reduction concepts, sensitivity analysis and reliability-based design optimization. Practical applications using existing software. Prerequisite: 310. SPRING. [3] Mahadevan.

317. Stability of Structures. Buckling analysis of perfect and imperfect columns, mathematical treatment of various stability problems and stability criteria, dynamic and static instability, energy methods. Buckling of frames, trusses, beam-columns, rings, and tubes. [3] Basu. (Offered on demand)

318. Prestressed Concrete. Behavior and design of statically determinate prestressed concrete structures under bending moment, shear, torsion, and axial load effects. Design of statically indeterminate prestressed structures like continuous beams, frames, slabs, and shells. Creep and shrinkage effects and deflections of prestressed concrete structures. Applications to the design and construction of bridges and buildings. Prerequisite: 235 or equivalent. [3] Basu. (Offered on demand)

325a–325b–325c. Individual Study of Civil Engineering Problems. Literature review and analysis of special problems under faculty supervision. [Variable credit: 1–4 each semester]

351. Public Transportation Systems. Study of public transportation, with emphasis on planning, management, and operations; paratransit, ridesharing, and rural public transportation systems. Prerequisite: 256. [3] (Offered on demand)

353. Airport Planning and Design. Integration and application of the principles of airport master planning from the beginning stages of site selection through actual design of an airport facility. Specific study topics address demand forecasting, aircraft characteristics, capacity analyses, and geometric design of runways, terminals, and support facilities. Prerequisite: 225, Transportation Systems Engineering, or consent of instructor. [3] Staff. (Offered on demand)

355. Advanced Transportation Design. An in-depth view of the design process. Complex design problems and solutions. Computer-based analytical and design tools. Comprehensive design projects. Prerequisite: 255. [3] (Offered on demand)

356. Advanced Transportation Planning. A continuation of the concepts from CE 256. Analytical techniques used in forecasting travel. Computer-based models, transportation and energy contingency planning methods. Prerequisite: 256. [3] (Offered on demand)

357. Theory of Traffic Flow. Traffic flow from the perspective of probability as applied to highway, intersection, and weaving capacities. Discrete and continuous flow, vehicle distributions, queuing, and simulation. Prerequisite: 257. [3] Staff. (Offered on demand)

359. Emerging Information Systems Applications. (Also listed as MT 359) An introduction to emerging information systems technologies and their role in improving productivity and efficiency in managing engineering operations. Design of integrated approaches to enhance the speed, accuracy, reliability, and quantity of information available for decision support. Emphasis on case studies of innovative applications in transportation and manufacturing, leading to individual and group projects requiring new product development. Prerequisite: background in transportation or manufacturing operations, or consent of instructor. FALL. [3] Staff.

369. Master's Thesis Research. [0]

371a–371b. Reliability and Risk Engineering Seminar. Seminars by expert speakers will provide a wide range of perspectives on reliability and risk assessment and management of multidisciplinary engineering systems. Topics on infrastructure and environmental systems; mechanical, automotive, and aerospace systems; network systems (power distribution,

water and sewage systems, transportation, etc.); manufacturing and construction; and electronic and software systems. FALL, SPRING. [1–1]

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

389. Master of Engineering Project. Not for M.S. or Ph.D. students. [0]

399. Ph.D. Dissertation Research.

Classical Studies

CHAIR Barbara Tsakirgis

DIRECTOR OF GRADUATE STUDIES Kathy L. Gaca

PROFESSORS EMERITI Robert Drews, F. Carter Phillips, Susan Ford Wiltshire

PROFESSORS Thomas A. J. McGinn, Jack M. Sasson

ASSOCIATE PROFESSORS Kathy L. Gaca, Joseph L. Rife, Barbara Tsakirgis

ASSISTANT PROFESSORS Elizabeth Jelinek, Amanda Krauss, David Petrain,
Bronwen L. Wickkiser

SENIOR LECTURERS Kieran Hendrick, Daniel P. Solomon

LECTURER Keith M. Kitchen

DEGREE OFFERED:

CLASSICS. *Master of Arts*

✦ THE Department of Classical Studies offers a selective M.A. program that provides a solid basis for either of two important goals in the field of Classics. First, the department trains promising M.A. candidates who aspire to apply to and enter a nationally ranked Ph.D. program in classical languages or in other recognized fields of Classics, such as ancient history and classical art and archaeology. The department also trains M.A. candidates who aspire to become effective teachers of Latin and/or Greek. The program, as broadly defined, involves a minimum of 36 hours and a maximum of 48 hours of course work over a two-year period. During the two years, the Classics M.A. student is also required to pass proficiency examinations in Greek and Latin and either proficiency examinations or course requirements in history and art. The student must also demonstrate reasonable proficiency in reading classical scholarship in German or French, or in another Romance language (e.g., Italian or Spanish). Applicants should be able to read both Latin and Greek, though not necessarily both at the same level of proficiency, and they also should have completed an elementary course in German, French, or another Romance language. Every M.A. student is also required to present a Master's Paper during the fourth semester.

On entering, every student takes diagnostic examinations in Greek and Latin prose and poetry. The examinations are not graded and are intended only for the determination of a student's proficiency in the languages at the time of matriculation and for placement in courses. The examinations test familiarity with language and with scansion.

Each semester each student takes at least three and no more than four courses for credit. It is expected that every student will take both seminars regularly offered in Greek and Latin each semester. The proficiency examinations in Greek and Latin are made up of passages taken from the M.A. reading list. The two examinations test familiarity with language and scansion. The proficiency examinations are offered regularly over the course of the M.A. program.

The requirements for history and for art are fulfilled either by taking two courses in each area (history: Classics 208 or 209 and 212 or 213; art: Classics 204 or 205 and 206) or by examination. In order to fulfill the requirement with course work, a student must earn a B+ or better in each of the two courses in the given areas. If the student chooses to fulfill the requirement with an examination, the examination of two hours' length is taken at the very beginning of the fourth semester. One re-take of each examination is allowed.

In the fourth semester every student gives to faculty and graduate students an oral presentation based on a Master's Paper, which is a reworking and expansion of a paper that has been written as part of the Classics M.A. program. Before presentation, the written Master's Paper will first be approved by the professor of the seminar in which the paper originated. The final public presentation will include questions from the faculty.

A distinguished feature of Vanderbilt's M.A. program in Classics is the anticipation that in the summer following the first year in residence, M.A. candidates will study in the Mediterranean. Students in good standing are urged to apply for the summer programs offered by the American School of Classical Studies in Athens (ASCSA) and the American Academy in Rome (AAR), or to a comparable academic Classics program as a secondary alternative. To qualify for a secondary alternative, M.A. students must first apply to both the ASCSA and the AAR, in the hope of being accepted into at least one of these two summer programs. They also generally receive Rankin Fellowship funding from the department to support this study abroad.

Because students pursuing a graduate degree in Classics normally do so with aims that include teaching Latin, Greek, or Classics, the department makes every effort to provide each student with some teaching experience. In the second year of residence, an M.A. candidate may expect to gain experience as a teaching assistant, primarily as an instructor in an elementary Latin section or, secondarily, as an assistant in a large Classics, Greek, or Latin course.

Successful students in the Classics M.A. program are encouraged to pursue Classics Ph.D. studies in a nationally ranked doctoral program that is well positioned to help its Classics doctoral recipients to find a rewarding professional appointment. Faculty in the department are eager to support this aspiration, such as by advising the student about which Classics Ph.D. programs are best suited to his or her interests, and by doing their best to facilitate the student's successful entry into such a doctoral program.

If they so choose, Classics M.A. students with interdisciplinary interests are also welcome to apply for, and may be accepted into, an interdisciplinary

Ph.D. program at Vanderbilt that promotes further graduate study in Classics, such as history, religious studies, Greek philosophy, English, and art history.

Greek

201. Beginning Greek I. (Formerly 101) The elements of classical Greek. Reading of simplified texts from authors of the fifth and fourth centuries B.C. FALL. [4] Petrain.

202. Beginning Greek II. (Formerly 102) Continuation of 201. Completion of the elements of classical Greek through readings from classical authors. Introduction to Homeric and Hellenistic Greek. Prerequisite: 201 or departmental placement. SPRING. [4] Petrain.

203. Intermediate Greek I: Classical and Koiné Greek. Review of Greek grammar, and reading from classical and biblical texts. Prerequisite: 202. FALL. [3] Hendrick.

204. Intermediate Greek II: Homer's *Iliad*. Selected reading and interpretation; history and literary characteristics of the Homeric epic; practice in reading of meter. Prerequisite: 203. SPRING. [3] Wickkiser.

212. The Greek Historians. Selections from the major Greek historians, especially Herodotus and Thucydides, and study of their philosophy of history; investigation of the development of historical prose writing. Prerequisite: 204. SPRING. [3] Hendrick.

215. The Greek Tragedians. Selections from the plays of Aeschylus, Sophocles, and Euripides. Survey of the development of tragedy. May be repeated for credit with change of subject matter. Prerequisite: 204. FALL. [3] Gaca.

216. Readings in Plato and Aristotle. Selected readings from the dialogues of Plato and from the ethical writings of Aristotle. Corollary readings and discussions of the pre-Socratic philosophers and the post-Aristotelian schools. Prerequisite: 204. [3] (Offered 2009/2010)

218. Greek Lyric Poetry. The Greek melic, elegiac, and iambic traditions, with an introduction to the Greek dialects and special emphasis on Archilochus, Tyrtaeus, Alcaeus, and Sappho. Prerequisite: 204. [3] (Offered 2009/2010)

240. The Gospels in Greek. Matthew and selections from the other Gospels. Prerequisite: 203 or departmental placement. [3] (Not currently offered)

277. Readings in Greek Philosophy. Selected readings from the dialogues of Plato and from the ethical writings of Aristotle. Corollary readings and discussion of the pre-Socratic and post-Aristotelian schools. Paper and reports required. Prerequisite: 3 hours above 204. [3] (Not currently offered)

289. Independent Study. Designed for majors wanting to familiarize themselves with works and authors not covered in the regular curriculum. Prerequisite: 6 hours above 204. FALL, SPRING. [Variable credit: 1–3 each semester, not to exceed a total of 6]

294. Special Topics in Greek Literature. [3] (Offered 2009/2010)

313. Seminar in Classical Greek Prose. May be repeated for credit with change of subject matter. FALL. [3] Wickkiser.

314. Seminar in Classical Greek Poetry. May be repeated for credit with change of subject matter. SPRING. [3] Gaca.

320. Seminar in Early Greek Poetry. [3] (Not currently offered)

Latin

101G. Latin Reading Course for Graduate Students. One semester survey of grammar and vocabulary coupled with extensive reading and exercises. Available to graduate students for "no credit" only. Three hours per week. [0] (Not currently offered)

201. Catullus. Reading and interpretation of Catullus' poems; aesthetic, political, and rhetorical contexts; fundamentals of Latin meter. Prerequisite: 104 or departmental placement. [3] (Offered 2009/2010)

202. Ovid. Reading and interpretation of selections from the *Metamorphoses* or other works of Ovid. Prerequisite: 104 or departmental placement. [3] (Offered 2009/2010)

203. The Lyric Poetry of Horace. Reading and interpretation of Horace's *Epodes* and *Odes*; relation to the Greco-Roman lyric tradition and to Augustan politics. Prerequisite: 104 or departmental placement. FALL. [3] Wickkiser.

205. Latin Letters. The literary letters of Seneca and Pliny, with a brief introduction to the personal correspondence of Cicero and the letters discovered at Vindolanda. Prerequisite: 104 or departmental placement. [3] (Offered 2009/2010)

206. Cicero and the Humanistic Tradition. Study of Cicero's career and thought, and of his contribution to the development of the concept of *humanitas*. Readings from his letters, speeches, and philosophical works. Prerequisite: 104 or departmental placement. FALL. [3] Hendrick.

212. Roman Comedy. Reading of selected comedies of Plautus and Terence; study of the form of Roman comedy and its relation to Greek New Comedy. Prerequisite: 104 or departmental placement. [3] (Offered 2010/2011)

215. The Roman Historians. Selections from Sallust, Livy, and Tacitus, with attention to their objectives and methods; analysis of Roman historiography and its relation to Greek and early Christian historiography. Prerequisite: 104 or departmental placement. FALL. [3] Krauss.

220. Vergil: *The Aeneid*. An intensive study of the entire poem, in the context of the epic tradition. Prerequisite: 104 or departmental placement. [3] (Offered 2010/2011)

260. Early Christian Writers. Selections from the writings of Latin Christians, from the account of Perpetua's martyrdom to the *Confessions* of Augustine. Prerequisite: 3 hours above 104. [3] (Not currently offered)

264. Roman Satire. The satires of Horace and Juvenal; the origins of Roman satire; history and conventions of the genre; background reading in other Roman satirists. Prerequisite: 3 hours above 104, Intermediate Latin II. SPRING. [3] Solomon.

268. Lucretius: *De Rerum Natura*. Lucretius' poem studied both in the tradition of Epicurean philosophy and as a landmark in the development of the Latin didactic epic; background material in the fragments of Epicurus and some treatment of the Epicurean movement in Italy and especially in Rome. Prerequisite: 3 hours above 104, Intermediate Latin II. [3] (Offered 2010/2011)

289. Independent Study. Designed for majors wanting to familiarize themselves with works or authors not covered in the regular curriculum. Prerequisite: 6 hours above 104, Intermediate Latin II. FALL, SPRING. [Variable credit: 1–3 each semester, not to exceed a total of 6]

294. Special Topics in Latin Literature. [3] (Offered 2009/2010)

313. Seminar in Classical Latin Prose. May be repeated for credit with change of subject matter. SPRING. [3] Staff.

314. Seminar in Classical Latin Poetry. May be repeated for credit with change of subject matter. FALL. [3] Petrain.

Classics

Courses below the 300 level require no knowledge of either Greek or Latin.

203. Aegean Art and Archaeology of the Bronze Age. The art and archaeology of the major cultures around the Aegean Sea between 3000 and 1000 B.C.: Minoan, Helladic or Mycenaean of the Greek mainland, Cycladic and those of Anatolia. No credit for students who have completed 223. [3] Tsakiris. (Not currently offered)

204. Archaic and Classical Greek Art and Architecture, 1000 to 400 B.C. Sculpture, vase painting, architecture, and the minor arts from about 1000 B.C. to the late fifth century B.C. Formal and stylistic developments in relation to changing cultural background. No credit for students who have completed 227. [3] Tsakiris. (Offered 2009/2010)

205. Late Classical Greek and Hellenistic Art and Architecture. Sculpture, vase painting, architecture, and the minor arts from after the Parthenon to the Roman Empire. A focus on those media (wall painting and mosaic) which develop significantly in this period. [3] Tsakiris. (Not currently offered)

206. Roman Art and Architecture. Sculpture, architecture, and painting from the tenth century B.C. to the early fourth century A.D. Daily life of the Romans as seen in the towns of Pompeii and Herculaneum. No credit for students who have completed 228. [3] Tsakiris. (Offered 2009/2010)

207. History of the Ancient Near East. From the neolithic period to the conquests of Alexander the Great, in the geographical area from Persia to Troy and Egypt. Special attention to the history of Israel. [3] (Offered 2009/2010)

208. History of Greece, to Alexander the Great The Greek world from the beginning of the Mycenaean Age (1650 B.C.) to the end of the Classical period. Special attention to the relationship between political history and the development of Hellenism. [3] (Offered 2009/2010)

209. Greece and the Near East from Alexander to Theodosius From Alexander's conquest of the Persian Empire to the ascendancy of Christianity in the late fourth century. Emphasis on social, cultural and religious transformations, within the framework of political history. [3] (Offered 2009/2010)

211. The Greek City. The example of ancient Athens. The stoa, the theater, the house, and fortifications. Institutions such as the courts, the public assembly, and the family. Literary, historical, archaeological, and philosophical sources. [3] Tsakiris. (Offered 2009/2010)

212. History of the Roman Republic. (Also listed as History 210) The growth and evolution of the Roman world, from the foundation of the city in the seventh century B.C. to the reign of Caesar Augustus. The Romans' unification of Italy, conquest of the Mediterranean and western Europe, adoption of Hellenism, and overthrow of the Republic. No credit for students who have had the former 209 (History of Rome). FALL. [3] Hendrick.

213. History of the Roman Empire. (Also listed as History 211) The Roman world from Augustus to the collapse of the western empire in the fifth century. Political, military, social and religious history. Special attention given to problems arising from use of the primary

sources as well as to controversies in modern scholarship. No credit for students who have had the former 209 (History of Rome). SPRING. [3] Hendrick.

216. Greek Sculpture. Style, materials, and techniques ca. 900–31 B.C. The sculptor's craft and reasons for the creation of both free-standing and architectural sculpture. [3] Tsakirgis. (Offered 2009/2010)

217. Art and Architecture of Ancient Egypt. Art, architecture, and culture of Egypt from the fourth millennium through the Old, Middle, and New Kingdoms. Sculpture, wall painting, architecture, and material culture. FALL. [3] Tsakirgis.

220. Women, Sexuality, and the Family in Ancient Greece and Rome. The status and role of women, law and the regulation of the private sphere, sexuality and gender role, demography and family structure, marriage, children, religion, domestic architecture and the household economy, ancient critiques of the family, and the impact of Christianity. SPRING. [3] Krauss.

222. Classical Tradition in America. Influences of classical Greece and Rome on the literature, politics, architecture, and values of the United States from the colonial period to the present. [3] (Not currently offered)

224. Ancient Origins of Religious Conflict in the Middle East. Religious oppositions in the eastern Mediterranean world from the Maccabean revolt to the Muslim conquests of the seventh century; beginnings of religious militancy; challenges of monotheism to Greco-Roman civilization; conversion, persecution, and concepts of heresy and holy war in Christianity, Judaism, and Islam. FALL. [3] Drews.

225. Humor, Ancient to Modern. Ancient comic forms juxtaposed with modern theories of humor. Aristophanic Old Comedy, New Comedy, and Satire. Modern parallels. SPRING. [3] Krauss.

231–232. Akkadian. A two-semester introduction to the cuneiform script and to the grammar of Akkadian, the language of ancient Mesopotamia. Selected readings in Old Babylonian (CODEX Hammurabi, Mari letters) and Neo-Assyrian texts (Creation Poem, Gilgamesh Epic). FALL, SPRING. [3–3] Sasson.

236. Culture of the Ancient Near East. A survey of highly sophisticated Near East cultures of the last three millennia before the common era (B.C.E.). Discussion of political histories, and the social, religious, and intellectual heritage of Mesopotamia, Egypt, and Anatolia through excavated artifacts and written documents. [3] Sasson. (Not currently offered)

238. The Amarna Age. The Amarna period from the sixteenth through the twelfth centuries B.C.E., as illumined by excavations of palaces and temples in Egypt, Anatolia, Canaan, and Mesopotamia as well as the vast historical, legal, and literary documents of the period. Focus on the internationalism and theological speculation of the period as seen through the powerful personalities and accomplishments of leaders such as Thutmose III, Suppiluliumas, Ramses II, and the spiritually influential Akenaten. [3] Sasson. (Not currently offered)

240. The Trojan War in History, Art, and Literature. Representations in Classical Greek art, literature, and archaeological evidence. The composition of the Homeric epics; the meaning of the Trojan War to later audiences. SPRING. [3] Tsakirgis.

295. Periclean Athens. Ancient Athens in the age of Pericles. Literature, history, art, architecture, and archaeological evidence. Capstone seminar for the major; preference given to senior majors. SPRING. [3] Tsakirgis.

305. Seminar in Classical Art and Architecture. May be repeated for credit with change of subject matter. [3] Tsakirgis. (Not currently offered)

309. Seminar: Studies in Ancient History. May be repeated for credit with change of subject matter. [3] (Not currently offered)

355. Seminar in Classics. [3] (Not currently offered)

369. Master's Thesis Research. [0]

398. Independent Study. An individual reading and study program on an author or area of classical antiquity not treated in the regular curriculum. No formal instruction is given, but the student's work is supervised and evaluated by one or more members of the staff. Up to 12 hours of 398 may be earned, but no more than 3 hours in any one semester. Open only to students who have completed one year of graduate study in classics. F ALL, SPRING. [Variable credit: 1-3]

Community Research and Action

CHAIR Joseph Cunningham

DIRECTOR OF GRADUATE STUDIES Paul Dokecki

PROFESSOR EMERITUS John Newbrough

PROFESSORS Sandra Barnes, Leonard Bickman, Paul Dokecki, Carolyn Hughes,
Velma McBride-Murry, Susan Saegert, Marybeth Shinn, Kenneth Wallston

PROFESSOR OF THE PRACTICE Vera Stevens Chatman

RESEARCH PROFESSOR Mark Lipsey

ASSOCIATE PROFESSORS Joseph Cunningham, James Fraser, Craig Anne Heflinger,

Robert Innes, Torin Monahan, Douglas Perkins, Paul Speer

ASSISTANT PROFESSORS Kimberly Bess, Maury Nation

DEGREES OFFERED: *Master of Science, Doctor of Philosophy*

✦ THE graduate program in community research and action is an interdisciplinary program combining community psychology, with its emphasis on rigorous applied research, and community development, with its strong tradition of empirically grounded practice. It is designed to train action-researchers in applied community studies in one of two areas of specialization: community development or evaluation methods. It serves doctoral students who desire advanced preparation in community research methods and work at higher levels in community and governmental organizations or who are preparing themselves for academic positions. The Ph.D. degree includes (a) a core set of courses covering community psychology, community development, ethics, public and community health, and organizational theory and change; (b) research methodology covering quantitative and qualitative methods, action research, field research, and program evaluation; (c) advanced content areas; and (d) minors that are designed individually, drawing from within the university, from other departments and schools (e.g., sociology, economics, divinity), and from other departments and specializations within Peabody College (e.g., leadership and organizations, quantitative psychology). Planning is done with the major professor

and approved by the student's committee. Students are expected to take a master's degree as part of their doctoral studies. Students entering with a nonempirical master's degree are expected to complete an empirical study.

3100. Community Inquiry. Overview of issues and methods in community research. Epistemology, theory, research design, critical analysis, levels of inquiry and the range of data collection and analysis methods available for community research. [3]

3200. Ethics of Community Research and Action. This course is intended to develop the ability to analyze situations encountered by action-researchers in community psychology, community development, prevention and community health/mental health, organizational change, community studies, and related community-based professional activities from the perspectives of (1) practice ethics, (2) research ethics, (3) policy ethics, and (4) the ethical/value issues entailed in conceptualizing the "ideal" community or society. SPRING. [3]

3460. Fieldschool in Intercultural Education. This course takes place in a community other than one's own either domestically or internationally over a ten-week period in the summer session. It provides training in community field research and analysis techniques directed to human, social, and civic development issues. SUMMER. [1–3]

3470. Community Psychology. (Also listed as Psychology and Human Development 347P) Introduction to theory, research, and action in community psychology, the study and application of psychological solutions to social and mental health problems at the community, organizational, and societal levels. The course overviews values in the field; the history of mental health care and individualistic psychology; ecological theory; stress, coping, and social support; conceptions of community environments; prevention; self-help; empowerment; organizational change; under-served populations; the role of research in social intervention and policy; and community development. FALL. [3]

3600. Community Development and Urban Policy . This course provides the beginning graduate student with an introduction to theory, practice, and research in Community Development (CD) and in urban social policy. It has a laboratory portion in which the student works on a CD project in the local community and uses that to propose to the relevant authorities a new social policy to implement the findings of the CD project. SPRING. [3]

3610. Development Project Design and Evaluation. This course examines how development projects and programs intended to improve social, economic, health, energy, environmental, and other conditions in human communities are designed by development professionals and how they determine whether or not such interventions achieve their purposes and warrant similar investment in the future. Analytical work undertaken at several stages in the design and evaluation process, including social, financial, managerial, legal, environmental, and other analyses, as well as impact analysis, are carried out. The purpose is to understand the ways applied research underpins and influences development investment decisions. [3]

3621. Theory and Application in Action Research. This course is designed to provide students with both intellectual and practical exposure to action research and applied research methods—particularly in relation to working for social change. The course will focus on the issue of knowledge generation and the role of knowledge production in social power. Practical experience will be gained by conducting research on community projects and applying the concepts gained in course work. Prerequisite: one graduate statistics course. [3]

3640. Global Dimensions of Community Development. The course is designed to (a) provide in-depth understanding of the nature, structure, functioning, and development of community organizations in societies different from our own as they relate to (b) multilateral or global

organizations that span different societies and nation states. A major goal is to prepare students for work in cross-cultural settings, in organizations characterized by cultural diversity, or in institutional contexts that serve a culturally diverse clientele. To do this, the course explores the economic globalization process and the cultural and social responses to globalization in various parts of the world. The main focus is on analysis of differing ways that people in communities are organizing themselves to realize their human potential in the context of globalization and the nascent emergence of global communities. FALL. [3]

3660. Faith and Politics in Community . The intersection between religion and politics, especially its form within local communities of the South, is the subject of this multidisciplinary seminar. The course bridges the social sciences and humanities to investigate how local cultural and religious forces propel citizens toward political and religious decisions and actions. Field research data drawn from ongoing investigations in Tennessee communities provide an empirical as well as theoretical foundation to the analysis. The seminar is team taught by faculty from the Law School, College of Arts and Science, Divinity School, and Peabody College. Prerequisite: permission of the instructor. [3]

3665. High Poverty Youth: Improving Outcomes. (Also listed as SPED 3080) Youth from high poverty backgrounds often are placed at risk for a host of unfavorable outcomes including academic failure, school dropout, drug abuse, unemployment, and incarceration. In this class, we will be working with schools and community agencies in Nashville to improve outcomes for youth living in high poverty neighborhoods. There are class meetings twice weekly as well as ongoing field-based experiences. Field work includes mentoring, tutoring, or providing job readiness training to youth in neighborhood community centers or in students' high schools. [3]

3690. Master's Thesis Research. FALL, SPRING. [Variable credit: 0–6]

3790. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

3870. Thesis Development Seminar. The purpose of this course is to help students plan empirical M.S. theses. Students must register for both fall and spring semesters in that order. Fall is devoted to the identification of a tentative topic or area of study. Spring is devoted to developing a draft thesis proposal, including presentation of the problem, a critical literature review, research questions, a draft methods, and approach to data analysis sections. SPRING. [3]

3872. Practicum. This course provides an opportunity to integrate theory, knowledge, and skills by applying them to the solution of problems in practicum sites. Prerequisite: HOD 3000. SPRING. [3]

3930. Readings and Research in Community Research and Action. Individual programs. May be repeated. Consent of instructor required. FALL, SPRING. [Variable credit: 1–3]

3960. Special Topics in Community Research and Action. May be repeated with a change in topic. FALL, SPRING. [Variable credit: 1–4]

3990. Ph.D. Dissertation Research. [Variable credit: 0–6]

Computer Science

CHAIR Daniel M. Fleetwood

DIRECTOR OF GRADUATE STUDIES Jeremy P. Spinrad

PROFESSORS EMERITI Charlotte F. Fischer, Patrick C. Fischer, William H. Rowan Jr.,
Horace E. Williams

PROFESSORS Gautam Biswas, Benoit Dawant, Lawrence W. Dowdy, J. Michael Fitzpatrick,
Gabor Karsai, Douglas C. Schmidt, Janos Sztipanovits

ASSOCIATE PROFESSORS Constantin Aliferis, Robert E. Bodenheimer, Douglas H. Fisher,
Stephen R. Schach, Jeremy P. Spinrad

ASSOCIATE PROFESSOR OF THE PRACTICE Gerald H. Roth

ASSISTANT PROFESSORS Julie A. Adams, Yi Cui, Aniruddha S. Gokhale, Xenofon D.
Koutsoukos, Subramani Mani, Yuan Xue

RESEARCH ASSISTANT PROFESSORS Brad Malin, Zhao Shi

LECTURER Julie Johnson

DEGREES OFFERED: *Master of Science, Doctor of Philosophy*

✦ THE graduate program in computer science is structured around six primary research areas: (1) distributed and networked systems, (2) embedded and hybrid systems, (3) image processing and graphics, (4) intelligent systems, (5) software and systems engineering, and (6) theory. A variety of advanced graduate courses are offered in each of these areas.

Doctoral candidates are required to complete a minimum of 36 hours of formal course work, which may include at most 6 hours of independent study. The distribution of courses must contain three 300-level courses in the student's primary research area, and four 300-level courses in at least three of the other primary research areas. All students must take CS 310, which can be used to satisfy the distribution requirements above. CS 258 and CS 253 may be counted as 300-level courses for satisfying the distributional requirements.

The master's degree in computer science may be earned through (a) the regular program that includes a thesis or (b) a non-thesis program requiring 30 hours of course work. Under either plan at least 12 hours must be in approved 300-level courses.

The Master of Engineering, an advanced professional degree for engineers, is offered by the School of Engineering.

231. Computer Organization. The entire hierarchical structure of computer architecture, beginning at the lowest level with a simple machine model (e.g., a simple von Neumann machine). Processors, process handling, I/O handling, and assembler concepts. Graduate credit not given for computer science majors. Prerequisite: 201, corequisite: EECE 116/116L. FALL, SPRING. [3]

250. Algorithms. Advanced data structures, systematic study and analysis of important algorithms for searching; sorting; string processing; mathematical, geometric, and graph algorithms; classes of P and NP, NP-complete and intractable problems. Prerequisite: 201 and 212. FALL, SPRING. [3]

251. Intermediate Software Design. High quality development and reuse of architectural patterns, design patterns, and software components. Theoretical and practical aspects of developing, documenting, testing, and applying reusable class libraries and object-oriented frameworks using object-oriented and component-based programming languages and tools. Prerequisite: 201. FALL, SPRING. [3]

252. Theory of Automata, Formal Languages, and Computation. Finite-state machines and regular expressions. Context-free grammars and languages. Pushdown automata. Turing machines. Undecidability. The Chomsky hierarchy. Computational complexity. Prerequisite: 212. SPRING. [3]

253. Image Processing. (Also listed as Electrical Engineering 253) The theory of signals and systems is extended to two dimensions. Coverage includes filtering, 2-DFFT's, edge detection, and image enhancement. Three lectures and one laboratory period. FALL. [4]

255. Introduction to Numerical Mathematics. (Also listed as Mathematics 226) Numerical solution of linear and non-linear equations, interpolation and polynomial approximation, numerical differentiation and integration, least-squares curve fitting and approximation theory, numerical solution of differential equations, errors and floating point arithmetic. Application of the theory to problems in science, engineering, and economics. Student use of the computer is emphasized. Prerequisite: computer programming and linear algebra. FALL, SPRING. [3]

257. Linear Optimization. (Also listed as Mathematics 288) An introduction to linear programming and its applications. Formulation of linear programs. The simplex method, duality, complementary slackness, dual simplex method, and sensitivity analysis. The ellipsoid method. Interior point methods. Possible additional topics include the primal-dual algorithm, cutting planes, or branch-and-bound. Applications to networks, management, engineering, and physical sciences. Prerequisite: linear algebra and computer programming. SPRING. [3]

258. Introduction to Computer Graphics. Featuring 2D rendering and image-based techniques, 2D and 3D transformations, modeling, 3D rendering, graphics pipeline, ray-tracing, and texture-mapping. Prerequisite: linear algebra, 201, junior standing. FALL. [3]

259. Introduction to Computer Animation. Introduction to the principles and techniques of computer animation. Students work in small groups on the design, modeling, animation, and rendering of a small animation project. Topics include storyboarding, camera control, skeletons, inverse kinematics, splines, keyframing, motion capture, dynamic simulation, particle systems, facial animation, and motion perception. Prerequisite: 201, Linear Algebra. SPRING. [3]

260. Artificial Intelligence. Introduction to the principles and programming techniques of artificial intelligence. Strategies for searching; representation of knowledge; automatic deduction, learning, and adaptive systems. Survey of applications. Prerequisite: 250, Algorithms, and 270, Programming Languages, or consent of instructor. FALL. [3]

265. Introduction to Database Management Systems. Logical and physical organization of databases. Data models and query languages, with emphasis on the relational model and its semantics. Concepts of data independence, security, integrity, concurrency. Prerequisite: 201. FALL. [3]

269. Project in Artificial Intelligence. Students work in small groups on the specification, design, implementation, and testing of a sizeable AI software project. Projects (e.g., an "intelligent" game player) require that students address a variety of AI subject areas, notably heuristic search, uncertain reasoning, planning, knowledge representation, and learning. Class discussion highlights student progress, elaborates topics under investigation, and identifies other relevant topics (e.g., vision) that the project does not explore in depth. Prerequisite: 260 or consent of instructor. SPRING. [3]

270. Programming Languages. General criteria for design, implementation, and evaluation of programming languages. Historical perspective. Syntactic and semantic specification, compilation and interpretation processes. Study of data types and data control, procedures and parameters, sequence control, nesting, scope and storage management, run-time representations. Non-standard languages, problem-solving assignments in a laboratory environment. Prerequisite: 231, Computer Organization. FALL, SPRING. [4] Roth.

274. Modeling and Simulation. General theory of modeling and simulation of a variety of systems: physical processes, computer systems, biological systems, and manufacturing processes. Principles of discrete-event, continuous, and hybrid system modeling, simulation algorithms for the different modeling paradigms, methodologies for constructing models of a number of realistic systems, and analysis of system behavior. Computational issues in modeling and analysis of systems. Stochastic simulations. Prerequisite: CS 201, Math 194 or 198, Math 216 or 218. SPRING. [3]

276. Compiler Construction. Review of programming language structures, translation, loading, execution, and storage allocation. Compilation of simple expressions and statements. Organization of a compiler including compile-time and run-time symbol tables, lexical scan, syntax scan, object code generation, error diagnostics, object code optimization techniques, and overall design. Use of a high-level language to write a complete compiler. Prerequisite: 231, Computer Organization. FALL. [3] Roth.

278. Principles of Software Engineering. The nature of software. The object-oriented paradigm. Software life-cycle models. Requirements, specification, design, implementation, documentation, and testing of software. Object-oriented analysis and design. Software maintenance. Prerequisite: 270. FALL. [3]

279. Software Engineering Project. Students work in teams to specify, design, implement, document, and test a nontrivial software project. The use of CASE (Computer-Assisted Software Engineering) tools is stressed. Prerequisite: 278. SPRING. [3]

281. Principles of Operating Systems I. Overview of goals of operating systems. Introduction to the resource allocation and control functions of operating systems. Parallel processing and primitives for their synchronization. Use of parallel processes in designing operating system subsystems. Methods for implementation of parallel processes on conventional computers. Introduction of notions of virtual memory, paging, protection of shared and non-shared information. Structures of files of data in secondary storage. Security issues. Case Studies. Prerequisite: 231, Computer Organization. FALL, SPRING. [3]

282. Principles of Operating Systems II. Projects involving modification of a current operating system. Lectures on memory management policies, including virtual memory. Protection and sharing of information, including general models for implementation of various degrees of sharing. Resources allocation in general, including deadlock detection and prevention strategies. Introduction to operating system performance measurement, for both efficiency and logical correctness. Two hours lecture and one hour laboratory. Prerequisite: 281. SPRING. [3]

283. Computer Networks. Computer communications, network architectures, protocol hierarchies, and the open systems interconnection model. Modeling, analysis, and specification of protocols. Wide area networks and local area networks including rings, buses, and contention networks. Prerequisite: 281. SPRING. [3]

284. Computer-Systems Analysis. Techniques for computer-system performance evaluation with emphasis on applications. Topics include: hardware/software/hybrid measurement and instrumentation techniques, benchmarking, simulation techniques, elementary queuing

models, data analysis, operational analysis, performance criteria case studies. Project involving a real computer system. Prerequisite: 281. FALL. [3]

285. Network Security. Principles and practice of network security. Security threats and mechanisms. Cryptography, key management, and message authentication. System security practices and recent research topics. Prerequisite: 283. FALL. [3]

291–292. Special Topics. [Variable credit: 1–3 each semester] (Offered on demand)

310. Design and Analysis of Algorithms. Set-manipulation techniques, divide-and-conquer methods, the greedy method, dynamic programming, algorithms and graphs, backtracking, branch-and-bound, lower bound theory, NP-hard and NP-complete problems, approximation algorithms. Prerequisite: 250, Algorithms. SPRING. [3]

311. Graph Algorithms. Algorithms for dealing with special classes of graphs. Emphasis on subclasses of perfect graphs and graphs that can be stored in a small space. Interval, chordal, permutation, comparability, and circular-arc graphs; graph decomposition. Prerequisite: 310 or Math 275. [3]

315. Automated Verification. Systems verification and validation, industrial case studies, propositional and predicate logic, syntax and semantics of computational tree and linear time logics, binary decision diagrams, timed automata model and real-time verification, hands-on experience with model-checking using the SMV, SPIN, and UPPAAL tools, and state reduction techniques. FALL. [3]

320. Algorithms for Parallel Computing. Design and analysis of parallel algorithms for sorting, searching, matrix processing, FFT, optimization, and other problems. Existing and proposed parallel architectures, including SIMD machines, MIMD machines, and VLSI systolic arrays. Prerequisite: 310 or consent of instructor. [3] (Not currently offered)

343. High-Performance Computing for Engineers. (Also listed as Mechanical Engineering 343) Introduction to high-performance computing. Engineering applications. Focus on high-speed cluster computing. Class project applying high-performance computing to various research topics. SPRING. [3]

350. Artificial Neural Networks. (Also listed as Biomedical Engineering 350 and Electrical Engineering 350) Theory and practice of parallel distributed processing methods using networks of neuron-like computational devices. Neurobiological inspirations, attractor networks, correlational and error-correction learning, regularization, unsupervised learning, reinforcement learning, Bayesian and information theoretic approaches, hardware support, and engineering applications. SPRING. [3]

351. Advanced Animation. Current research issues and problems in computer animation, with special focus on motion capture, dynamic simulation, and key-framing. Cloth, deformable bodies, natural phenomena, geometric algorithms, procedural techniques, facial animation, hair, autonomous characters, flocking, empirical evaluation, and interfaces for animation. Prerequisite: CS 259 or consent of instructor. FALL. [3]

352. Human-Computer Interaction. An overview of human-computer interaction and problems of current interest. Human factors, GOMS, user interface design and evaluation, interaction modalities, distributed cognition, ubiquitous computing. A project involving design and evaluation will be performed. Prerequisite: consent of instructor. FALL. [3]

357. Advanced Image Processing. (Also listed as Electrical Engineering 357) Techniques of image processing. Topics include image formation, digitization, linear shift-invariant processing, feature detection, and motion. Prerequisite: Math 175. FALL. [3]

358. Computer Vision. (Also listed as Electrical Engineering 358) The fundamentals of computer vision and techniques for image understanding and high-level image processing. Includes image segmentation, geometric structures, relational structures, motion, matching, inference, and vision systems. Prerequisite: 357. SPRING. [3]

359. Medical Image Registration. Foundations of medical image registration. Mathematical methods and practical applications. Image-to-image registration, image-to-physical registration, applications to image-guided procedures and the most commonly used imaging modalities with an emphasis on tomographic images. FALL. [3]

360. Advanced Artificial Intelligence. Discussion of state of the art and current research issues in heuristic search, knowledge representation, deduction, and reasoning. Related application areas include: planning systems, qualitative reasoning, cognitive models of human memory, user modeling in ICAI, reasoning with uncertainty, knowledge-based system design, and language comprehension. Prerequisite: 260 or equivalent. FALL. [3]

362. Machine Learning. An introduction to machine learning principles of artificial intelligence, stressing learning's role in constraining search by augmenting and/or reorganizing memory. Topics include connectionist systems; concept learning from examples; operator, episode, and plan learning; problem-solving architectures that support learning; conceptual clustering; computer models of scientific discovery; explanation-based learning; and analogical reasoning. Psychological as well as computational interests in learning are encouraged. Prerequisite: 260, 360, or equivalent. SPRING. [3]

364. Intelligent Learning Environments. (Also listed as Electrical Engineering 355) Theories and concepts from computer science, artificial intelligence, cognitive science, and education that are important to designing, building, and evaluating computer-based instructional systems. Development and substantiation of the concept, architecture, and implementation of Intelligent Learning Environments. Multimedia and Web-based technology in teaching, learning, collaboration, and assessment. Prerequisite: 260, 360, or equivalent. SPRING. [3]

366. Distributed Artificial Intelligence. Principles and practice of multiple-agent systems. Game theory, distributed negotiation and decision making, distributed problem solving, cooperation, coalition formation and distributed learning. Prerequisite: 260. SPRING. [3]

369. Master's Thesis Research. [0]

375. Discrete Event Systems: Supervisory Control and Diagnosis. Algebraic structures, automata and formal language theory, process modeling with finite state automata, supervisory control theory, controllability and supervision, supervisory control under partial observation, modular and hierarchical supervisory control, supervisory control of real-time systems, fault diagnosis of discrete event systems, and modular diagnosis approaches. SPRING. [3]

376. Foundations of Hybrid and Embedded Systems. Modeling, analysis, and design of hybrid and embedded systems. Heterogeneous modeling and design of embedded systems using formal models of computation, modeling and simulation of hybrid systems, properties of hybrid systems, analysis methods based on abstractions, reachability, and verification of hybrid systems. FALL. [3]

377. Topics in Embedded Software and Systems. Specification and composition of domain-specific modeling languages. Design methodologies for embedded systems. Platforms for embedded system design and implementation. Analysis of embedded systems. SPRING. [3]

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

381. Advanced Operating-Systems Principles. Techniques for formally analyzing various issues in operating systems. Topics may include: process synchronization, interprocess communication, deadlock, naming, memory management, object capability models, architectural support, protection, fault tolerance. Prerequisite: 281. FALL. [3]

384. Performance Evaluation of Computer Systems. Techniques for computer-systems modeling and analysis. Topics covered include: analytical modeling with emphasis on queuing network models, efficient computational algorithms for exact and approximate solutions, parameter estimation and prediction, validation techniques, workload characterization, performance optimization, communication and distributed-system modeling. Prerequisite: 281 or 381. SPRING. [3]

385. Advanced Software Engineering. An intensive study of selected areas of software engineering. Topics may include: CASE tools, formal methods, generative techniques, aspect-oriented programming, metrics, modeling, reuse, software architecture, testing, and open-source software. Prerequisite: 278. FALL. [3]

386. System-Level Fault Diagnosis. An overview of the basic concepts of the theory of fault diagnosis and problems of current interest. Topics include the classical PMC and BGM models of fault diagnosis, hybrid permanent and intermittent (faults) models, diagnostic measures for one-step, sequential, and inexact diagnosis. Emphasis is on algorithmic techniques for solving the diagnosis and diagnosability problems in various models. Prerequisite: 381 or consent of instructor. [3]

387. Topics in Software Engineering. Topics may include empirical software engineering and open-source software engineering. Prerequisite: 278 or consent of instructor. SPRING. [3]

388. Model-Integrated Computing. Model-Integrated Computing (MIC) addresses the problems of designing, creating, and evolving information systems by providing rich, domain-specific modeling environments including model analysis and model-based program synthesis tools. Students are required to give a class presentation and prepare a project. FALL [3]

389. Master of Engineering Project. Not for M.S. or Ph.D. students. [0]

390. Individual Studies. Offered each term. [Variable credit: 1–3]

391–392. Seminar. [Variable credit: 1–3 each semester]

395–396. Special Topics. [3–3]

399. Ph.D. Dissertation Research.

3995. Half-time Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

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Earth and Environmental Sciences

CHAIR David J. Furbish

DIRECTOR OF GRADUATE STUDIES John C. Ayers

PROFESSORS EMERITI Leonard P. Alberstadt, Arthur L. Reesman, William G. Siesser,
Richard G. Stearns

PROFESSORS John C. Ayers, James H. Clarke, David J. Furbish, David S. Kosson,
Calvin F. Miller, Molly Fritz Miller

ASSOCIATE PROFESSOR Steven L. Goodbred

ASSISTANT PROFESSORS Guilherme Gualda, Kaye S. Savage

SENIOR LECTURERS Brendan Bream, Jonathan M. Gilligan

LECTURER N.Kinzly Moore

DEGREES OFFERED: *Master of Arts in Teaching, Master of Science,
Doctor of Philosophy (option in Environmental Science offered jointly with
Environmental Engineering)*

✎ A STUDENT earns the master's degree in earth and environmental sciences by completing 24 hours of formal course work and submitting an approved research thesis. Fields of study include sedimentology, geochemistry, Quaternary geology, tectonics, oceanography, igneous and metamorphic petrology, volcanology, environmental geology, and paleoecology. Graduate students in earth and environmental sciences must obtain permission from the department to receive credit for any course required for the undergraduate major: 220, 225, 226, 230, 240. Graduate students in other disciplines may receive credit for these courses. Six hours of graduate credit is required in another discipline or in an area of earth and environmental sciences other than that in which the student is pursuing thesis research.

220. Life Through Time. Ecology, classification, evolutionary history of important groups of fossils, emphasizing invertebrates. Change in marine ecosystems through geologic time. Causes and effects of rapid evolution events and mass extinctions. Three hours of lecture and one laboratory period per week. Prerequisite: 101 or junior standing as a biological sciences major. No credit for graduate students in EES. FALL. [4] M. Miller.

225. Earth Materials. Solid materials that make up the earth; rock, soil, and sediment—with emphasis on the minerals that are their major constituents. Hand specimen, optical, and X-ray methods of description and identification. Physical and chemical processes that form and modify earth materials and the use of these materials in interpreting earth processes of the past and present. Field trips. Three lectures and one laboratory period per week. Prerequisite: 101 or 104. FALL. [4] C. Miller.

226. Petrology. Nature, distribution, and theories of origin of igneous, metamorphic, and sedimentary rocks. Mineralogy as a function of rock-forming conditions. Laboratory emphasis on description and interpretation of rocks, using hand sample and microscope techniques. Field trips. Three lectures and one laboratory period per week. Prerequisite: 225. No credit for graduate students in EES. SPRING. [4] Ayers.

230. Sedimentology. The origin and composition of sedimentary particles, their transportation to the site of deposition, actual deposition, and the processes involved in lithifying sediments into solid rock. Emphasis on interpretation of ancient source areas and depositional environments. Terrigenous, carbonate, and other rock types will be studied. Field trips.

Three lectures and one laboratory period. Prerequisite: 225 or 226. No credit for graduate students in EES. SPRING. [4] Goodbred.

240. Structural Geology and Rock Mechanics. Principles of rock deformation; mechanics, fractures, folds, foliation, primary structures. Field trips. Three lectures and one laboratory period per week. Pre- or corequisite: 226. No credit for graduate students in EES. SPRING. [4] Staff.

257. Hydrogeology. An introduction to hydrogeology with emphasis on distribution, movement, and chemistry of groundwater. Principles of groundwater flow, water chemistry, and geology related to exploration, evaluation, development, and protection of groundwater resources. Prerequisite: 225 and one semester each of chemistry, physics, and calculus. FALL. [3] Savage.

258. Environmental Geochemistry. Concepts, principles and models of chemical processes operating at or near the earth's surface. Thermodynamics, kinetics, organic and isotope geochemistry, environmental mineralogy. Application of concepts to environmental problems. Prerequisite: 225 and Chemistry 102a–102b. FALL. [3] Ayers.

260. Geochemistry. Application of chemistry to study the distribution and cycling of elements in the crust of the earth. Includes chemical bonding and crystallization, phase rules and phase diagrams, chemical equilibria, theories on the origin of elements, earth, ocean, atmosphere, and crust. Prerequisite: 225 and Chemistry 102a–102b, or consent of instructor. FALL. [3] Ayers.

261. Geomorphology. Analysis of the Earth's landforms, their morphology, history, and the processes that form them. The building of relief and its subsequent transformation by geologic processes on hillslopes, rivers, coasts, wetlands, and glaciers. The natural history and human impacts on land forms. Field trips. Prerequisite: 101 and junior standing in natural science, anthropology, or engineering. SPRING. [3] Furbish.

262. Geochemistry Laboratory. Laboratory to accompany 258 or 260. Corequisite: 258 or 260. One three-hour laboratory per week. FALL. [1] Staff.

264. Methods in Environmental Geology. Field, laboratory, and analytical methods in geological and environmental investigations. Chemical and physical principles of analytical instrumentation; analysis and reliability of instrumental measurements. Laboratory and field projects; sample collection; field measurements; chemical/spectroscopic analysis. Prerequisite: junior standing, 225 and previous or concurrent in 257 or 260. SPRING. [3] Savage.

279. Problems in Sedimentology and Paleobiology. Relation between past life and its environment as recorded in sedimentary rocks. Emphasis on reconstructing the depositional environment and the ancient communities recorded in Paleozoic sedimentary sequences in Tennessee, and investigating recent research on the interplay between ecosystems and physical environment during critical periods of earth history. Prerequisite: 220 and 226. FALL. [3] M. Miller.

289a–289b. Directed Study. Readings with related field and/or laboratory research in pursuit of a scholarly project conceived and executed under the supervision of a faculty member. Open to senior majors and graduate students. Other students must have consent of department chair. Does not count toward minimum requirements for the major. FALL, SPRING, SUMMER. [Variable credit: 1–2 each semester] Staff.

291a–291b. Independent Study. Readings with related field and/or laboratory research in pursuit of a scholarly project conceived and executed under the supervision of a faculty member. Open to senior majors and graduate students. Other students must have consent of department chair. Does not count toward minimum requirements for the major. FALL, SPRING. [Variable credit: 2–3 each semester] Staff.

292a–292b. Senior Honors Research. Independent research under faculty supervision culminating in an oral presentation and written thesis submitted to the faculty. Open only to honors candidates. Does not count toward minimum requirements for the major. FALL, SPRING. [Variable credit: 2–3 each semester] Staff.

302a–302b. Preparation for Research in Environmental Sciences and Engineering. Research design and questions, critical review of scientific literature and data, and research proposals. FALL, SPRING. [1–1] Staff.

315. Igneous Petrochemistry and Petrogenesis. Application of phase equilibria and trace element and isotope chemistry to interpretation of the origin and history of igneous rocks and to large-scale geological problems to which magma genesis is relevant. Problem solving based upon geochemical data emphasized. Prerequisite: general chemistry, and analytic geometry and calculus, and GEOL 226, or Chemistry 230. SPRING. [3] C. Miller.

320. Aqueous Geochemistry. The chemistry of subsurface waters, including near-surface groundwaters, reforming solutions, and metamorphic and igneous fluids. Quantitative analysis of mineral-fluid equilibria using thermodynamics and phase diagrams. Role of aqueous fluids in heat and mass transport, chemical reactions in rocks, and geochemical cycles. Prerequisite: general chemistry, and GEOL 260 or physical chemistry. FALL. [3] Ayers.

322. Environmental Mineralogy. Importance of minerals for biogeochemical processes in Earth surface and near-surface environments for health, as hazards, and as remediation tools in mining and nuclear waste environments. Includes molecular-scale processes governing mineral interactions with fluids. SPRING. [3] Savage.

325. Environmental Applications of Geochemical Modeling. Computer-based modeling of geochemical processes. Model types include aqueous speciation and solubility, surface adsorption, reaction paths, inverse mass balance, kinetic and coupled reactive transport. Application to environmental problems including surface water chemistry, groundwater transport, subsurface waste storage, acid mine drainage, and deep well injection. Prerequisite: 258 or 260. SPRING. [3] (Alternate years) Ayers.

369. Master's Thesis Research.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

390. Special Topics and Advanced Techniques in Geology. [Variable credit: 2–4]

East Asian Studies

DIRECTOR Yoshikuni Igarashi

Affiliated Faculty

PROFESSOR Richard King (Religious Studies)

RESEARCH PROFESSOR James Auer (Center for U.S.–Japan Studies, VIPPS)

ASSOCIATE PROFESSORS Gerald Figal (History), Yoshikuni Igarashi (History),

Tracy Miller (History of Art), Ruth Rogaski (History)

ASSISTANT PROFESSORS Jinah Kim (History of Art), Ling Hon Lam (East Asian Studies)

SENIOR LECTURERS Xianmin Liu (Chinese), Peter Lorge (History), Keiko Nakajima (Japanese)

LECTURERS Jing Liu (Chinese), Ayaka Sogabe (Japanese), Qing Wei (Chinese)

✳ A NUMBER of courses are available in East Asian languages, social sciences, and humanities, from which a field of minor concentration may be constructed, subject to approval of the student's adviser.

A partial listing of relevant courses follows. See departmental listings for courses offered in the current academic year.

The members of the Committee on East Asian Studies are James Auer (*Center for U.S.-Japan Studies, VIPPS*), Yoshikuni Igarashi (*History*), Jinah Kim (*History of Art*), Richard King (*Religious Studies*), Xianmin Liu (*Chinese*), Peter Lorge (*History*), Tracy Miller (*History of Art*), Keiko Nakajima (*Japanese*), and Ruth Rogaski (*History*).

CHINESE: 201–202, Elementary Chinese; 214–216, Intermediate Chinese; 231, Chinese Calligraphy; 241–242, Advanced Chinese; 251–252, China Today, 255–256, Business Chinese.

EAST ASIAN STUDIES: 211, Popular Culture in Modern Japan; 212, Explorations of Japanese Animation; 219, Exploring Premodern Chinese Novels; 220, Explorations of Modern Chinese Fiction; 225, Sex and Gender in Premodern Chinese Culture; 226, Martial Arts Literature and Film; 240, Current Japan-U.S. Relations; 289a–289b, Independent Study; 294a–294b, Special Topics.

HISTORY: 106, Premodern China; 107, Modern China; 108, Premodern Japan; 109, Modern Japan; 152, Modern East Asia; 182, Sexuality and Gender in China; 202, Themes in Modern Chinese History; 203, Chinese Thought; 205, Play and Pleasure in Early Modern Japan; 206, Japan's Recent Past; 282, Chinese Medicine.

HISTORY OF ART: 120, Arts of East Asia; 246, Religion and Politics in South and Southeast Asian Art; 247, Himalayan Art; 251, East Asian Architecture and Gardens; 252, Arts of China; 253, Arts of Japan; 254, Japanese Painting and Prints.

JAPANESE: 200a, Introductory Modern Japanese; 200b, Introductory Modern Japanese; 201, Beginning Modern Japanese I; 202, Beginning Modern Japanese II; 211, Second-Year Modern Japanese I; 212, Second-Year Modern Japanese II; 241, Third-Year Modern Japanese I; 242, Third-Year Modern Japanese II; 251, Fourth-Year Modern Japanese I; 252, Fourth-Year Modern Japanese II.

POLITICAL SCIENCE: 214, The Japanese Political System; 216, The Chinese Political System (Not currently offered).

RELIGIOUS STUDIES: 130, Introduction to Asian Traditions; 244, Buddhist Traditions; 249, Zen Buddhism (Not currently offered).

211. Popular Culture in Modern Japan. Popular culture in Japan from 1900 to the present. The rise of mass culture and media, song, sports, food, fashion, and popular film genres. FALL. [3] Figal.

212. Explorations of Japanese Animation. Introduction to the form and content of Japanese animation as globalized popular entertainment and as a speculative artistic medium that explores history and memory, nature and technology, human identity, carnivalesque comedy, and gender relations. SPRING. [3] Figal.

219. Premodern Chinese Novels. Chinese novels from sixteenth to eighteenth century. History and fiction; orality and print; history of reading. Construction of individual subjects and

communities; opera and film adaptation; material culture; sex and gender; and social and domestic space. SPRING. [3] Lam.

220. Short Stories and Novels in Twentieth-Century China, Taiwan, and Hong Kong.

Traumatic experience of modernity; nation and narration; new perceptions of time and space; transformed gender relations; contested national and local identities. All texts in English translation. No prerequisites. FALL. [3] Lam.

225. From Antiquity to the Nineteenth Century. Philosophical and medical concepts of sexual differences; political and religious allegories of love and transsexuality; literary imaginations of body and gender performance. All readings in English translation. No prerequisites. FALL. [3] Lam.

226. Martial Arts Literature and Film: Traditions and Transformations. Tales and novels from antiquity to twentieth century; Chinese action film since the late 1960s. Interplay among literature, opera, and film. Representation of body; history of film technology and style; cultural and gender politics; national identity; transnational cinema. SPRING. [3] Lam.

240. Current Japan-U.S. Relations. Similarities and differences in theory and practice in the United States and Japan on public policy issues such as trade, defense, environment, education, medical care, and racial prejudice. SPRING. [3] J. Auer (Peabody College).

289a–289b. Independent Study. Designed primarily for majors who want to study East Asian subjects not regularly offered in the curriculum. Must have consent of instructor. [Variable credit: 1–3 each semester]

294a–294b. Special Topics. Seminars or lecture courses devoted to topics in areas of competence of individual instructors and of interest to students, as announced in the *Schedule of Courses*. [Variable credit: 1–3 each semester]

Economics

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Mototsugu Shintani, George H. Sweeney

ASSISTANT PROFESSORS Christopher Bennett, Claudia Rei, Joel Rodrigue, Diana N.

Weymark, Benjamin Zissimos

DEGREES OFFERED: *Master of Arts, Doctor of Philosophy*

✦ GRADUATE study in economics at Vanderbilt prepares students for research and teaching careers in universities and for planning and leadership positions in government, international agencies, and business. The curriculum emphasizes applications of economic theory. Participation in research projects, in joint seminars, and in informal research workshops assures close student-faculty interaction. Students have been attracted to the program from all parts of the United States and from more than sixty countries.

A master's degree (without thesis) may be awarded after completion of 42 hours of Ph.D. course work with an average of at least *B* or better.

For the Ph.D. degree, which requires 72 hours and a thesis, the student normally takes at least 51 hours of formal course work, including required courses in economic history or history of economic thought, statistics, and econometrics, along with courses in microeconomic theory and macroeconomic theory. Economics courses in this catalog numbered below 250 and the managerial studies courses listed below are available for minor credit in other graduate programs. Only those courses numbered 250 and above carry graduate credit in economics graduate programs. There is a mathematics requirement, normally satisfied by taking Economics 300, Selected Topics in Mathematics for Economists. There is no foreign language requirement.

The faculty requires that all doctoral students, before undertaking the qualifying examination, pass written examinations in economic theory (micro and macro) and in one major elective field chosen from the following: advanced economic theory, econometrics, economic growth and development, economic history, finance, industrial organization, international economics, labor, money, and public finance. A second field chosen from that list may be completed by either passing a written examination or by passing two courses in this field numbered above 300 with a grade of *B* or better in each course. A second field in which the department offers only one course above 300 or a field requested by petition must be passed by written examination. Each year the department offers a variety of graduate-level courses beyond the core.

All students entering the Ph.D. program take a competence test in mathematics measuring knowledge of elementary mathematics. It is expected that each entering student have completed one year of calculus and courses in intermediate microeconomic and macroeconomic theory, statistics, and linear algebra.

Detailed information is available on request from the department.

Graduate Program in Economic Development

Students may be interested in the Graduate Program in Economic Development, a more professionally oriented degree program. Students in this program take courses in economic theory and statistics and in such areas as economic development, international trade, and monetary and fiscal policies, and can earn a Master of Arts degree. This program is described under Special Programs.

222. Latin American Economic Development. Recent economic growth and structural change of Latin American economies. The general issues of development economics will be explored, such as the mobilization of savings and capital for nation, import-substituting industrialization, inflation, agricultural reform, regional and national economic integration, population growth and migration, and balance-of-payments problems. No credit for graduate students in economics. [3]

231. Intermediate Microeconomic Theory. Development of the techniques of analysis for problems of resource allocation. Theories of choice and production for individual economic agents in competitive and monopolistic environments. Behavior of markets. Determination of prices, wages, interest, rent, and profit. Income distribution. No credit for graduate students in economics. Prerequisite: one semester of calculus. [3]

232. Intermediate Macroeconomic Theory. National income accounting and analysis. Classical, Keynesian, and contemporary models determining national income, employment, liquidity, price level, and economic growth. No credit for graduate students in economics. Prerequisite: one semester of calculus. [3]

251. Wages, Employment, and Labor Markets. Theories of wages and employment, dual labor markets, internal labor markets, and labor's share of national income. Empirical studies of labor mobility, the effects of unions on relative wages and resource allocation, occupational and industrial wage differentials, and selected labor markets. Prerequisite: 150, Statistics, and 231, or consent of instructor. [3]

252. Antitrust Economics. The purposes and effects of antitrust laws in the United States. Economic theory applied to the problems of preserving and enhancing competition. Evaluation of incentives created by judicial precedents in terms of efficiency and performance. Prerequisite: 231. [3]

253. Introduction to Econometrics. Quantitative methods of economic analysis. Measurement, specification, estimation, and interpretation of economic models, introduction to econometric computation using microcomputers. No credit for graduate students in economics. Prerequisite: 231 and either 150 or Math 218 and 218L. [3]

254. Public Finance. Theories of the state and collective decisions, fiscal federalism, public goods and externalities. Tax theory: equity, efficiency, and growth. Taxation of goods, factors, and corporations. Cost-benefit analysis. Prerequisite: 231 or equivalent. [3]

259. Financial Instruments and Markets. Theoretical and empirical approaches to the analysis of monetary and other financial instruments. Portfolio analysis, interest rate risk, and financial futures and options markets. Prerequisite: 231, 232. [3]

FnEc261. Investment Analysis. Investment principles and practices. Emphasis on security analysis to develop techniques and standards of investment appraisal. Principles of portfolio analysis. The forecasting problem in meeting portfolio needs of individuals and institutions. Special studies to develop capacity for investigating and reporting. Prerequisite: 150 and 240. [3]

262. History of Economic Thought. Evolution of economic ideas from the ancient Greeks to the contemporary world with attention to the seminal thoughts of Adam Smith, David Ricardo, J. S. Mill, Alfred Marshall, and J. M. Keynes. Prerequisite: 231 and 232. [3]

263. International Trade. International trade in goods and services. Patterns of trade; gains and losses from trade, tariffs, and other commercial policies; economic integration; and international factor movements. Prerequisite: 231. [3]

264. Open Economy Macroeconomics. Economics of international monetary, financial, and macroeconomic relationships. Effects of monetary and fiscal policies in open economies, balance of payments, exchange rate determination, and international monetary institutions. Prerequisite: 232. [3]

265. Macroeconomic Models for Policy Analysis. Mathematical models of overlapping generations, rational expectations, and open economies with price rigidities applied to social security, government debt, exchange rates, monetary policy, and time inconsistent optimal policy. Prerequisite: 232. [3]

266. Problems in United States Economic History. Analysis of major issues and debates in American economic history. Prerequisite: 231. [3]

267. Economics of Poverty and Discrimination. Develops methodologies used to measure the effectiveness of governmental programs aimed at reducing poverty and discrimination, and uses these methodologies to examine the equity and efficiency of current programs. Topics include social security, food stamps, and equal employment opportunity legislation. Prerequisite: 231 or consent of instructor. [3] (Not currently offered)

268. Economics of Health. An examination of some of the economic aspects of the production, distribution, and organization of health care services, such as measuring output, structure of markets, demand for services, supply of services, pricing of services, cost of care, financing mechanisms, and their impact on the relevant markets. Prerequisite: 231. [3]

269a–269b. Selected Topics in Economics. Topics of special interest, as announced in the *Schedule of Courses*. [3]

270. Economics of Sports. Application of economic principles to professional and collegiate team sports. Theory of sports leagues, demand for sports, the market for athletes, racial discrimination, broadcasting rights, antitrust issues. No credit for both 270 and 280. Prerequisite: 150 and 231. [3]

271. Economic History of Europe. The stages of development of capitalism and modern industry in Europe since the decline of feudalism. The interrelation of government policy, financial institutions, scientific discovery, and the spirit of individualism. Prerequisite: 231. [3] (Not currently offered)

273. Game Theory with Economic Applications. Rational decision making in non-cooperative, multi-person games. Single play and repeated games with complete and incomplete information. Economic applications of games, such as auctions, labor-management bargaining, pricing and output decisions in oligopoly, and common property resources. Prerequisite: 231. [3]

274. Industrial Organization. The structure of contemporary industry and the forces that have shaped it, including manufacturing, trade, and transportation. The role of the large corporation in modern industrial organization. The relation of industrial structure to economic behavior and performance. Prerequisite: 231. [3]

FnEc 275. Financial Management. (Formerly Business Administration 275) Analysis of cases representing capital budgeting, forecasting cash flow, risk assessment, capital structure, mergers and acquisitions. Seminar. Prerequisite: 240. [3]

278. The Technical Basis for Environmental Policy. (Also listed as Civil Engineering 278 and Management of Technology 278). The engineering and economic foundations of environmental policy formation, mathematical computer modeling of the environment, and economic valuation of environmental quality. Treatment and site clean-up processes, fundamental equations of environmental engineering, the notion of market failure, and economics of monitoring and enforcement. [3] (Not currently offered)

279. Urban Economics. Urban growth, the development of suburbs, the location of firms, housing markets, transportation, property taxes, and local government services. Prerequisite: 231. [3]

280. Seminar in Sports Economics. Economic theory of sports leagues: competitive balance, player labor markets and owner capital markets. Theories of league expansion, rival leagues, franchise relocation, and sports venues. Research paper. No credit given for both 280 and 270. Preference given to senior majors. Prerequisite: 231. [3]

282. Education and Economic Development. The influence of education on economic growth and development in developing countries. Theory and measurement of economic growth and human capital. Distributional and efficiency effects of human capital policies. Influence of international organizations on human capital development. Education and social cohesion. Prerequisite: 231 and 150 or consent of instructor. [3]

283. Economics of the Environment. Economic theory and analytic tools involved in selected environmental problems: air and water quality and hazardous waste management. Prerequisite: 231. [3] (Not currently offered)

285. Law and Economics. Analysis of the influence of legal rules and institutions on the behavior of individuals and on economic efficiency and equity. Applications from civil procedure, contract, tort, and criminal law. Prerequisite: 231. [3]

286. Economics of Human Resources. Human capital theory: economic effect of population trends, fertility, and migration. Additional topics chosen from education, household economics, health, nutrition, demand for children and child care, sex and race discrimination, crime, investment in research and development, the economic value of life and time. Prerequisite: 231 or 233 and 201, Statistics, or consent of instructor. [3] (Not currently offered)

287. European Economic Integration. Policy issues concerning economic integration in Europe, including trade, migration, income distribution, environmental quality, macroeconomic policy, and monetary union. Analysis of European Community institutions. Prerequisite: 231; corequisite: 232. [3] (Not currently offered)

288. Development Economics. Determinants of national economic growth for pre-industrial and newly industrial countries. Inequality and poverty. Imperfect credit markets and microfinance. Political constraints and corruption. Policy issues relevant to developing economics. Prerequisite: 150 and 231. [3]

300. Selected Topics in Mathematics for Economists. Selected mathematical topics used in the analysis of static and dynamic models. Prerequisite: one year of calculus (Math 171a–171b, Analytic Geometry and Calculus, or equivalent). [3]

301. Microeconomic Theory (M.A. Level). The price system in consumer demand and as a mechanism for organizing production, allocating resources, and distributing the national income. [3]

302. Macroeconomic Theory (M.A. Level). National income accounting. Theories of income, employment and price determination. Growth and planning models. Monetary theory. [3]

304a. Microeconomic Theory I. Analysis of resource allocation and relative prices. Behavior of individual economic units and markets. Topics include models of technology, cost and profit and the firm; consumer preferences, constraints and choice; expected utility theory and risk aversion; partial equilibrium under competition and monopoly; partial equilibrium welfare and surplus. [3]

304b. Microeconomic Theory II. Noncooperative game theory, information economics, public goods and an introduction to general equilibrium models. Topics include Nash equilibrium,

sequential rationality, incomplete information; oligopoly; bargaining; adverse selection, signaling and screening; principal-agent models; externalities and public goods; introductory general equilibrium and welfare analysis. [3]

304c. Microeconomic Theory III. General equilibrium, social choice and welfare. General equilibrium, existence, stability and uniqueness results; fundamental theorems of welfare; core and equilibria; general equilibrium with time and uncertainty; social choice theory and mechanism design; axiomatic bargaining and welfare. No credit for students who have completed former 331. [3]

305a. Macroeconomic Theory I. Keynesian and neoclassical models of the economy. Introduction to dynamic models. [3]

305b. Macroeconomic Theory II. Neoclassical and new theories of economic growth. Overlapping generations models. [3]

305c. Macroeconomic Theory III. Theories of consumption, investment, demand and supply of money, the labor market. Monetary and fiscal policy. New Keynesian economics. The role of expectations. No credit for students who have completed former 376. [3]

306. Statistical Analysis (M.A. Level). Interpretation of statistical materials, the principles of statistical inference, the use of available statistics for problems of economic analysis, and the importance of statistics in economic policy and administration. [3]

307. Statistical Analysis. Statistical methods applicable to quantitative research in economics and business. Distribution theory, statistical inference, and selected multivariate statistical methods. Prerequisite: 201, Statistics, or equivalent. [3]

308. Econometrics (M.A. Level). Empirical measurements with applications to basic economic relations. Specification, estimation of microeconomics and macroeconomics models for the purpose of testing hypotheses, forecasting, and evaluating policy. Prerequisite: 306. [3]

309. Econometrics. Analysis of specification errors in single equation estimation of economic relations and introduction to the estimation and application of simultaneous equation models. Prerequisite: 307 or consent of instructor. [3]

312a–312b. Health Economics. Conceptual and empirical analysis of demand for health, medical services, and insurance; decisions by physicians and hospitals about price, quantity, and quality of services; technological change; and structure and performance of the pharmaceutical industry. [3–3] (Not currently offered)

316. International Trade Theory. Classical, neoclassical, and contemporary theories of international trade; empirical evidence for them. Commercial policy, tariffs, the terms of trade and income distribution, international factor movements: economic unions. Trade and growth. Trade and welfare. [3]

317. International Monetary Economics. The balance of payments and the foreign exchange market. Elasticities, absorption, and monetary approaches to the adjustment mechanism. Interest rates and capital flows. Optimal currency areas, internal and external balance. International reserves and liquidity. [3]

320a–320b. Seminar in the Organization and Control of Industry. The structure of American industry; the origins and development of industrial concentration; the behavior and performance of oligopolistic and imperfectly competitive markets; the economics of public utilities. Public policy toward industrial structure and conduct, including antitrust policy, limitation of competition, and direct regulation. [3–3]

329a–329b. Labor Economics. Static and dynamic models of labor demand and labor supply and models of human capital development. Applications of the theory to selected topics including: migration, fertility, health, wage determination, education, unionism and industrial relations, employment policies, implicit contracting and layoffs, and discrimination. Examination of methodological problems related to the analysis of labor markets. [3–3] (Not currently offered)

332a. Theory of Money and Finance I. Advanced topics in monetary and financial economics spanning theory and applications. Topics include recently developed dynamic theories of money and asset pricing; inflationary dynamics; money, welfare, and growth; money and business cycles; financial development and growth; credit market imperfections and financial crises. [3]

332b. Theory of Money and Finance II. Analyzes microeconomic foundations and general equilibrium models of money and financial markets. Explores such topics as the theory of payments structure, capital asset pricing, rational expectations, efficient markets, contingent-claims markets, and others. Prerequisite: 259. [3]

333. Topics in Microeconomics. Advanced theory and applications. May be repeated for credit if there is no duplication of topic. [Variable credit: 1–3]

349a–349b. Reading Course. Designed to permit graduate students to do more intensive study in the area of their special interest than regular course offerings provide. Admission by consent of department chair and supervising professor. [Variable credit: 1–3 each semester]

353. Project Evaluation. Social-benefit cost analysis of investment projects: investment criteria, estimation of benefits and costs, and evaluation of shadow prices and of the social discount rate. The role of national planning. Case studies utilize the experience of developing economies. [3]

354a. Public Finance Theory. The social welfare foundations of public finance theory, theories of optimal taxes and public goods treating equity, efficiency, and incentive effects in partial- and general-equilibrium frameworks. Prerequisite: 254 or consent of instructor. [3] (Not currently offered)

354b. Public Finance Seminar. Special topics in applications of public finance theory, including some or all of the following: theories of fiscal federalism, fiscal politics, fiscal policy, externality and pollution, public pricing, social insurance, public income distribution, public debt, cost-benefit analysis, international aspects of public finance, generalized theory of public policy, and issues in tax-expenditure reform. Prerequisite: 354a or consent of instructor. [3] (Not currently offered)

355a–355b. Seminar in Research on Economic Development. How to select and define an economic problem, assemble relevant factual and statistical information, and analyze and interpret it. Students will write a research paper. May not be included in the 24 hours required for the M.A. degree. Completion of both semesters with an average grade of *B* counts in lieu of M.A. thesis. Open only to students in the Economic Development program. [3–3]

357. International Trade and Economic Development. Selected topics concerning the exchange and transfer of goods and resources between less- and more-developed countries. Possible topics include: the international monetary system, the SDR-aid link, dependence and imperialism, the role of trade in economic growth, foreign exchange strategies, and the structure of protection. Primarily designed for students in the Economic Development program. [3] (Not currently offered)

358a–358b. Policy Issues in Developing Economies. Economic analysis of problems in developing countries. 358a: Macroeconomic issues. Topics include monetary policy, financial repression and capital markets, fiscal policy structural adjustment, inflation, and management

of foreign debt. 358b: Microeconomic issues. Topics include public intervention in factor and commodity markets, migration, labor markets and employment, pricing and efficiency in the public sector, urban development and housing, and choices of technology. [3–3]

360. Agriculture and Economic Development. Food supply as a national problem; size and characteristics of population; agricultural technology; industrial-urban development and public policies as means of reducing market imperfections and raising output and incomes in rural areas. Case studies of the southern United States and selected underdeveloped countries. [3] (Not currently offered)

364. Economic Fluctuations and Stabilization Policy. The forces governing inflation, total output, and components of GNP, particularly investment decisions: macroeconomic models; short-term business forecasting; monetary, fiscal, and related stabilization policies. [3] (Not currently offered)

366a. Topics in Economic History: Microeconomic. This course will examine various microeconomic aspects of long-term development. Topics may include: the demographic transition, changes in labor force behavior, development of institutions, industrialization, migration, health, measurement of living standards and inequality. Students are expected to become familiar with various large-scale microeconomic databases containing historical information, such as the Integrated Public Use Micro-data Samples of the United States Census. [3] (Not currently offered)

366b: Topics in Economic History: Macroeconomic. This course will examine various macroeconomic aspects of long-term development. Topics may include: economic growth, the development of financial markets and the role of financial markets in economic development, the history and evolution of monetary and fiscal policy, capital market integration, and business cycles, including the Great Depression. Students are expected to become familiar with various macro-history databases (for example, the NBER database). [3] (Not currently offered)

369. Master's Thesis Research. [0–12]

370. Econometric Theory. Identification and estimation of simultaneous equation models. Small sample properties of estimators and Bayesian inference. Model building and testing of economic theory. Prerequisite: 309 or equivalent preparation. [3]

371. An Introduction to Economic History. Economic history in terms of measurement and theory. Factors associated with modern economic growth and institutional change in a variety of countries and time periods. Relation between economic history and history of thought. [3]

373. Time Series Econometrics. Estimation of stationary ARMA models, analysis of non-stationary time series models (unit roots and cointegration), introduction to structural time series models and spectral analysis. Models of time-varying conditional variances and models of regime-switching with applications to topics in macroeconomics and finance. Prerequisite: 309. [3]

374. Nonparametric and Semi-parametric Econometrics. Nonparametric and semi-parametric methods for the estimation and inference in econometric models. Methods include kernel, neural network, orthogonal series, and wavelets. Models include nonparametric models, the partially linear model, index models, and additive models. Prerequisite: 370 or equivalent. [3] (Not currently offered)

375. Topics in Econometrics. Advanced theory and applications. May be repeated for credit once if there is no duplication. [Variable credit: 1–3]

377. Topics in Macroeconomics. Advanced theory and applications. May be repeated for credit once if there is no duplication of topic. [Variable credit: 1–3] (Not currently offered)

379. Seminar in Urban Economics. Readings of current research in urban economics. Individual student research projects on topics in locational economics and urban public finance. Prerequisite: 279. Graduate students may audit 229, Urban Economics, simultaneously. [3] (Not currently offered)

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

383. Advanced Economics of Natural Resources and the Environment. Detailed analysis of the theoretical and empirical aspects of resource and environmental economics; modeling and empirical analysis of environmental externalities; theory of public investment as applied to natural environments; modeling and empirical analysis of renewable and non-renewable natural resources. [3] (Not currently offered)

388a–b. Development and Growth. Contemporary theories and empirical studies of growth and development. Patterns and sources of growth, research and technology transfer, human capital and labor market performance, organization and institutions, inequality and redistributive policy, and welfare costs of inflation. Prerequisite: Econ 304a–b, 305a–b. [3] (Not currently offered)

390. Ph.D. Dissertation Proposal Development. Prerequisite: permission of director of graduate studies. [0–3]

398. Workshop on Economics. Research seminar to aid advanced students in the selection of thesis topics and presentation of research papers. Topics covered depend on interests of students and faculty. [0–3]

399. Ph.D. Dissertation Research.

3995. Half-time Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

Electrical Engineering

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ASSOCIATE CHAIR A. B. Bonds

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ASSISTANT PROFESSORS Zhaohua Ding, William H. Robinson, Greg Walker,

Sharon M. Weiss

RESEARCH ASSISTANT PROFESSOR Sandeep Neema
ASSISTANT PROFESSOR OF THE PRACTICE Lason L. Watai

DEGREES OFFERED: *Master of Science, Doctor of Philosophy*

✦ PROGRAMS in electrical engineering are offered in the areas of analog and digital circuits, computer engineering, intelligent systems, solid state devices, signal and image processing and analysis, robotics, microelectronics, and related areas in biomedical engineering.

The Master of Science degree program requires 24 credit hours, including 18 hours in the major area (within EECE) and 6 hours in a minor area. At least 12 hours in the major area must be taken at or above the 300 level. The courses taken must also include one of the gateway courses in each of two of the following areas: electronics, computer, and signals and systems. Gateway courses are graduate-level courses with senior-level prerequisite, the list of which is maintained by the DGS. The remainder of the course work in the major must be taken at or above the 250 level. The minor will be six hours of graduate-level course work, typically outside of EECE. A maximum of 3 hours of independent study may be applied to the 18 hours required in the major area. The student's adviser must approve all courses. A research thesis is required. A non-thesis option is also offered, which requires an additional 6 hours of independent study constituting one single unit of research work.

A total of 72 hours is required for the Ph.D. Of these, 36 hours must be in course work with at least 24 of the 36 hours in EECE (exceptions can be made to this rule based on the recommendation of the student's adviser if the student research topic requires taking additional courses outside EECE). The courses taken must also include one of the gateway courses in each of the three following areas: electronics, computers, and signals and systems. Gateway courses are graduate-level courses with senior-level prerequisites, the list of which is maintained by the EE director of graduate studies, and posted on the EECS department Web site. Up to 6 hours of independent studies may be taken to fulfill the 36 hours requirement. Up to 24 hours of course work toward the master's degree will normally be applied to this total on approval by the committee. Up to 12 total hours of course work in the range 250–299 are allowed. CS courses in the student's area of research can also be taken for EECE graduate program credit with written approval of the student's adviser. The remainder of the 72 hours may be in dissertation research hours, in additional course work or independent study classes applicable to the student's program of study, and/or in transfer credit, if applicable. Students must complete at least 24 hours while in residence at Vanderbilt. At least 12 of these hours must be in formal course work.

Specific and current degree requirements (including course selection, committee selection, preliminary examination, thesis/dissertation, and dissertation defense policies) are detailed in the Graduate Policy Document. A copy of this document should be obtained from the program office.

The Master of Engineering, an advanced professional degree for engineers, is offered by the School of Engineering.

218. Microcontrollers. Microprocessor and microcontroller architecture with emphasis on control applications. Usage of assembly language and interfacing with programs written in high-level languages. Interfacing and real-time I/O with 8-bit microprocessors, control algorithms, and networking with microcontrollers. Prerequisite: EECE 116 and CS 101 or CS 103. Corequisite: EECE 218L. SPRING. [3]

218L. Microcontrollers Laboratory. Laboratory for EECE 218. A small structured project is required. One three-hour laboratory per week. Corequisite: EECE 218. SPRING. [1]

225. The Visual System. (Also listed as Psychology 236) Introduction to physiological optics, retinal anatomy, physiology, neurochemistry, color vision, brain processing, and clinical problems associated with the visual system. For students below senior standing, permission of instructor required. SPRING. [3]

233. Electromagnetics. Introduction to electromagnetic field theory. Maxwell's equations are developed from the historical approach. Electromagnetic waves are discussed with regard to various media and boundary conditions. Graduate credit except for electrical engineers. Prerequisite: Physics 116b. Corequisite: Math 196. FALL. [3]

235. Electronics I. Introduction to semiconductor devices and electronic circuits. Diodes, BJT and MOS transistors. Device models, modes of operation, biasing. Small-signal models, low-frequency analysis of single- and multi-stage analog amplifiers, simple amplifier design. Large signal models, dc analysis of digital circuits. No graduate credit for electrical engineers. Prerequisite: EECE 116. Corequisite: EECE 235L. FALL. [3]

235L. Electronics I Laboratory. Laboratory for EECE 235. One three-hour laboratory per week. Corequisite: EECE 235. FALL. [1]

252. Signal Processing and Communications. AM and FM modulation. Also, advanced topics in signal processing are treated. Prerequisite: EECE 214. SPRING. [3]

253. Image Processing. (Also listed as CS 253) The theory of signals and systems is extended to two dimensions. Coverage includes filtering, 2-D FFTs, edge detection, and image enhancement. Three lectures and one laboratory period. FALL. [4]

254. Computer Vision. Vision is presented as a computational problem. Coverage includes theories of vision, inverse optics, image representation, and solutions to ill-posed problems. Prerequisite: EECE 253. SPRING. [3]

256. Digital Signal Processing. Applications of Digital Signal Processing (DSP) chips to sampling, digital filtering, FFTs, etc. Three lectures and one laboratory period. Prerequisite: EECE 214. SPRING. [4]

257. Control Systems I. Introduction to the theory and design of feedback control systems, steady-state and transient analysis, stability considerations. Model representation. State-variable models. Prerequisite: EECE 213. FALL. [3]

258. Control Systems II. Modern control design. Discrete-time analysis. Analysis and design of digital control systems. Introduction to nonlinear systems and optimum control systems. Fuzzy control systems. Two lectures and one laboratory. Prerequisite: EECE 257. SPRING. [3]

261. Introduction to Voice/Data Networks. Overview of voice/data wide area networking (WAN) technologies, including the implementation of WAN designs. Prerequisite: Math 155 a/b, Physics 116a/b or equivalent. FALL. [3].

262. Introduction to Local Area Networks and Internetworking. Overview of Local Area Network (LAN) technology, internetworking, and selected higher layer applications. Common local area networking protocols, internetworking (bridging and routing), common routing protocols, dynamic routing algorithms, selected layer 4 applications, domain name system, and dynamic host configuration protocol. Prerequisite: EECE 261 or consent of instructor. SPRING. [3]

263. Signal Measurement and Analysis. (Also listed as BME 263) Discrete time analysis of signals with deterministic and random properties and the effect of linear systems on these properties. Brief review of relevant topics in probability and statistics and introduction to random processes. Discrete Fourier transforms, harmonic and correlation analysis, and signal modeling. Implementation of these techniques on a computer is required. Prerequisite: EECE 214, Probability and Statistics. FALL. [3]

264. Electromechanical Energy Conversion I. Theory and design of inductors, transformers, linear actuators, and simple motors. Prerequisite: EECE 213, Math 196. Corequisite: 233. FALL. [4]

265. Electromechanical Energy Conversion II. Theory and design of rotating machines. Dynamics and control of rotating machines. Prerequisite: EECE 264, EECE 257. SPRING. [4]

266. Power Electronics. Introduction to solid-state power electronics. Rectifiers, semiconductor switches, AC voltage controllers, controlled rectifiers, choppers, and inverters are studied. Three lectures and one laboratory. Prerequisite: EECE 213, EECE 235; Math 196. SPRING. [4]

267. Power System Analysis I. Analysis of large transmission and distribution networks. Analysis of power lines, load flow, short circuit studies, economic operation, and stability are introduced. Prerequisite: EECE 213. FALL. [3]

268. Power System Analysis II. Continued study of load flow, short circuit analysis, economic operation, and stability of power systems. Introduction to protection fundamentals. Prerequisite: EECE 267. SPRING. [3]

269. Electrical Energy Production. The production of electrical energy by conversion methods, little used today, which will become important as traditional sources of energy are depleted. Emphasis is on conservation, storage, efficiency, and direct energy conversion. Prerequisite: EECE 213, Math 196. No credit for both 269 and ME 265. SPRING. [3]

271. Introduction to Robotics. (Also listed as ME 271) History and application of robots. Robot configurations including mobile robots. Spatial descriptions and transformations of objects in three-dimensional space. Forward and inverse manipulator kinematics. Task and trajectory planning. Simulation and off-line programming. Prerequisite: Math 196 (or equivalent). ME 190 (or equivalent) recommended. FALL. [3]

272. Advanced Software Architectures. Tools and techniques for designing complex software systems. Programming language idioms, design patterns, and high-level architecture of systems. Overview of reactive systems, client-server architectures, distributed object systems, object database systems, and design methods. Lectures and seminars. A team-oriented approach is required. Prerequisite: CS 201 and knowledge of the C++ language. SPRING. [3]

273. Parallel Systems. An overview of the state of the field of Parallel Systems. Examination of the problems and limitations associated with developing parallel systems. Survey of current design trends and approaches for overcoming these problems. Critical evaluation of current and future parallel systems through review of current literature: distinguishing fact from fiction. Hands-on design experience through project work using available state-of-the-art parallel processors. Prerequisite: CS 101. SPRING. [3]

276. Embedded Systems. Advanced course on the design and application of embedded microcontroller-based systems. Architecture and capabilities of advanced microcontrollers. Embedded system modeling, design, and implementation using real-time and event-driven techniques. A structured project is required. Intended for seniors. Prerequisite: EECE 218. Corequisite: EECE 276L. FALL. [3]

276L. Embedded Systems Laboratory. Laboratory for EECE 276. A team-oriented structured project is required. One three-hour laboratory per week. Corequisite: EECE 276. FALL. [1]

277. FPGA Design. Design and applications of field-programmable gate arrays, CAD tools for design, placement, and routing. Practical experience is gained by implementing various designs on prototype FPGA board. A project is required. Prerequisite: EECE 116, EECE 218. SPRING. [3]

280. Electronics II. Integrated circuit analysis and design. High frequency operation of semiconductor devices. Frequency-response and feedback analysis of BJT and MOS analog amplifier circuits, multi-stage frequency-compensated amplifier design. Transient analysis of BJT and MOS digital circuit families. Digital-to-analog and analog-to-digital conversion circuits. Prerequisite: EECE 235. SPRING. [3]

283. Principles and Models of Semiconductor Devices. Physical principles of operation of the p-n junction, MOS field-effect transistor, and bipolar transistor. Fundamentals of charge transport, charge storage, and generation-recombination; application to the operation of MOSFET and BJT. Device modeling with emphasis on features and constraints of integrated circuit technologies. Prerequisite: EECE 235 or consent of instructor. SPRING. [3]

284. Integrated Circuit Technology and Fabrication. Introduction to monolithic integrated circuit technology. Understanding of basic semiconductor properties and processes that result in modern integrated circuit. Bipolar and MOSFET processes and structures. Elements of fabrication, design, layout, and applications as regards semiconductor microelectronic technologies. Prerequisite: EECE 235 or consent of instructor. SPRING. [3]

285. VLSI Design. Integrated circuit and fabrication techniques; CAD tools for design, layout, and verification; parasitic elements and their effects on circuit performance; system-level design experience is gained by completing design and layout phases of a project. Prerequisite: EECE 116, EECE 235 or consent of instructor. FALL. [3]

286. Audio Engineering. Engineering aspects of high fidelity sound reproduction, with emphasis on digital audio and loudspeakers. Analog-to-digital and digital-to-analog conversion, data storage, perceptual coding, loudspeaker design. Prerequisite: EECE 213 and EECE 235. SPRING. [3]

287. Engineering Reliability. Topics in engineering reliability with emphasis on electrical systems. Reliability concepts and models. Risk analysis. System examples. Prerequisite: senior standing. FALL. [3]

291–292. Special Topics. [Variable credit: 1–3 each semester]

295. Program and Project Management for EECE. Methods for planning programs and projects. Organization structures and information management for project teams. Communications between project teams and clients, government agencies, and others. Motivational factors and conflict resolution. Budget/schedule control. Similar to ENGM 274, but preparatory to the EECE senior design project course, EECE 296. Not for graduate credit. Credit given for only one of ENGM 274 and EECE 295. Prerequisite: senior standing. Corequisite: EECE 297. FALL. [3]

296. Electrical and Computer Engineering Design. Based on product specifications typically supplied by industrial sponsors, teams of students responsible for the formulation, execution, qualification, and documentation of a culminating engineering design. The application

of knowledge acquired from earlier coursework, both within and outside the major area, along with realistic technical, managerial, and budgetary constraints using standard systems engineering methodologies and practices. Not for graduate credit. Prerequisite: EECE 295, at least one DE course, senior standing. SPRING. [3]

297. Senior Engineering Design Seminar. Elements of professional engineering practice. Professionalism, licensing, ethics and ethical issues, intellectual property, contracts, liability, risk, reliability and safety, interdisciplinary teams and team tools, codes, standards, professional organizations, careers, entrepreneurship, human factors, and industrial design. Prerequisite: senior standing. Corequisite: EECE 295. FALL. [1]

301. Introduction to Solid-State Materials. The properties of charged particles under the influence of an electric field, quantum mechanics, particle statistics, fundamental particle transport, and band theory of solids will be studied. FALL. [3]

302. Electric and Magnetic Properties of Solids. A review of electromagnetic theory of solids using advanced mathematical and computational techniques. Dielectric, magnetic, and optical properties. Fundamental interactions of electromagnetic radiation and charged particles in solids. Prerequisite: EECE 301 or equivalent. SPRING. [3]

304. Radiation Effects and Reliability of Microelectronics. The space radiation environment and effects on electronics, including basic mechanisms of radiation effects and testing issues. Total dose, single-event, high-dose-rate, and displacement damage radiation effects. Effects of defects and impurities on MOS long-term reliability. SPRING. [3]

305. Topics in Applied Magnetics. Selected topics in magnetism, magnetic properties of crystalline and non-crystalline materials; ferrite materials for electronics and microwave applications, resonance phenomena. Prerequisite: EECE 302 or consent of instructor. [3]

306. Solid-State Effects and Devices I. The semiconductor equations are examined and utilized to explain basic principles of operation of various state-of-the-art semiconductor devices including bipolar and MOSFET devices. FALL. [3]

307. Solid-State Effects and Devices II. The structure of solids, phonons, band theory, scattering phenomena, and theory of insulators. [3]

311. Systems Theory. Analysis and design of multivariable control systems using state space methods. Stability, controllability, and observability treated. Controllers designed using pole placement, optimal linear regulator, and the method of decoupling. State reconstruction via observers. SPRING. [3]

331. Robot Manipulators. (Also listed as ME 331) Dynamics and control of robot manipulators. Includes material on Jacobian matrix relating velocities and static forces, linear and angular acceleration relationships, manipulator dynamics, manipulator mechanism design, linear and nonlinear control, and force control of manipulators. Prerequisite: EECE 271 (or equivalent). SPRING. [3]

341. Advanced Analog Electronics. Analysis and design of analog electronics circuits with emphasis on integrated circuits. Topics include operational amplifiers, wideband amplifiers, multipliers, and phase-locked loops. FALL. [3]

342. Advanced Digital Electronics. Analysis and design of digital electronic circuits with emphasis on integrated circuits. Topics include logic families, semiconductor memories, and the analog-digital interface. SPRING. [3]

343. Digital Systems Architecture. Architectural descriptions of various CPU designs, storage systems, IO systems, parallel and von Neumann processors and interconnection networks will be studied. [3]

350. Artificial Neural Networks. (Also listed as BME 350 and CS 350) Theory and practice of parallel distributed processing methods using networks of neuron-like computational devices. Neurobiological inspirations, attractor networks, correlational and error-correction learning, regularization, unsupervised learning, reinforcement learning, Bayesian and information theoretic approaches, hardware support, and engineering applications. SPRING. [3]

351. The Visual System. (Also listed as Cell and Developmental Biology 347, Neuroscience 347, and Psychology 336) Introduction to physiological optics, retinal anatomy, physiology, neurochemistry, color vision, brain processing, and clinical problems associated with the visual system. Graduate students attend one hour discussion section per week in addition to lecture and turn in a more extensive paper than undergraduates. SPRING. [3]

354. Advanced Real-Time Systems. Fundamental problems in real-time systems, with focus on modeling, analysis, and design. Topics include: scheduling theory and techniques, time synchronization, time- and event-triggered systems, distributed architectures, advanced programming languages for real-time systems. Literature reviews and projects. SPRING. [3]

355. Intelligent Learning Environments. (Also listed as CS 364) Theories and concepts from computer science, artificial intelligence, cognitive science, and education that facilitate designing, building, and evaluating computer-based instructional systems. Development and substantiation of the concept, architecture, and implementation of intelligent learning environments. Multimedia and web-based technology in teaching, learning, collaboration, and assessment. Prerequisite: CS 260, CS 360, or equivalent. SPRING. [3]

356. Intelligent Systems and Robotics. Concepts of intelligent systems, AI robotics, and machine intelligence, using research books and papers. Emphasis on how AI, brain research, soft computing, and simulations are advancing robotics. Class projects. SPRING. [3]

357. Advanced Image Processing. (Also listed as CS 357) Techniques of image processing. Topics include image formation, digitization, linear shift-invariant processing, feature detection, and motion. Prerequisite: Math 175; programming experience. FALL. [3]

361. Random Processes. An introduction to the concepts of random variables, functions of random variables and random processes. Study of the spectral properties of random processes and of the response of linear systems to random inputs. Introduction to linear mean square estimation. The emphasis is on engineering applications. FALL. [3]

362. Detection and Estimation Theory. Fundamental aspects of signal detection and estimation. Formulation of maximum likelihood, maximum a posteriori, and other criteria. Multidimensional probability theory, signal and noise problems, and Kalman filter structure are studied. SPRING. [3]

365. Biomedical Pattern Recognition. (Also listed as BME 365) General problems of pattern recognition with applications to biomedical signals and images. Topics such as feature extraction, cluster analysis, discriminant analysis, statistical decision functions, and machine learning will be introduced. Prerequisite: EECE 263 or equivalent. SPRING. [3]

369. Master's Thesis Research.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0-12]

389. Master of Engineering Project.

391-392. Seminar. [1-1]

393-394. Advanced Seminar for Ph.D. Candidates. [1-1]

395-396. Special Topics. Based on research and current developments in electrical engi-

neering of special interest to staff and students. [3–3]

397–398. Independent Study. Readings and/or projects on advanced topics in electrical engineering under the supervision of the staff. Consent of instructor required. [Variable credit: 1–3 each semester]

399. Ph.D. Dissertation Research.

Engineering Management

DIRECTOR David M. Dilts

DIRECTOR OF UNDERGRADUATE STUDIES John A. Bers

PROFESSORS EMERITI Jimmy L. Davidson, Robert W. House, Barry D. Lichter,
Robert T. Nash

PROFESSORS Mark D. Abkowitz, Gautam Biswas, David M. Dilts, Kazuhiko Kawamura,
Frank L. Parker

ADJUNCT PROFESSORS David A. Berezov, Christopher D. McKinney

ASSOCIATE PROFESSORS OF THE PRACTICE John A. Bers, Benjamin T. Jordan, Jr.

ASSISTANT PROFESSOR OF THE PRACTICE Kenneth R. Pence

✦ **COURSES** in engineering management are available for minor credit. Students should consult their advisers about the acceptability of the courses as related work in their specific program of study.

251. Finance and Accounting for Engineers. Finance and accounting topics are studied from the perspective of engineering professionals working in business organizations. Areas covered include time value of money, capital budgeting, capital formation, financial accounting and reporting, performance measurements, and working capital management. FALL, SPRING. [3] Berezov.

253. Technology-Based Entrepreneurship. Identification and evaluation of opportunities: risks faced by entrepreneurs, market assessment, venture capitalization, legal structures, tax implications for sharing technology-based businesses. FALL. [3] McKinney.

254. Production and Supply Chain Management. Manufacturing strategy, process analysis, product and process design, total quality management, capacity planning, inventory control, supply chain design, and advanced operations topics. Modeling and analysis using cases and spreadsheets. Prerequisite: ENGM 273 strongly recommended. FALL, SPRING. [3] Dilts.

273. Systems Engineering. An introduction to the fundamental considerations associated with the engineering of large-scale systems. Models and methods for systems engineering and problem solving using a systems engineering approach. Prerequisite: basic understanding of probability and statistics and engineering systems. FALL, SPRING, SUMMER. [3] Bers.

274. Program and Project Management. Project planning and charting. Methods for planning budgets, schedule control, motivational factors, and conflict resolution. Credit given for only one of ENGM 274, CE 286, or EECE 295. FALL, SPRING, SUMMER. [3] Pence.

275. Technology Assessment and Forecasting. Assess technological changes in social, political, economic, legal, and institutional environments. Intuitive thinking, exploratory

techniques, trend exploration, normative techniques of relevance. Term project required. Technology-society elective. SPRING. [3] McKinney.

290a–290b. Independent Study. Reading or projects on topics in engineering management under the supervision of the ENGM staff. Consent of instructor required. No more than 6 hours may be applied toward graduation. FALL, SPRING. [Variable Credit: 1–3 each semester] Dilts.

291–292. Special Topics. [Variable credit: 1–3 each semester]

English

CHAIR Jay Clayton

DIRECTOR OF GRADUATE STUDIES Kathryn Schwarz

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Carolyn Dever, Lynn E. Enterline, Sam B. Girgus, Roy K. Gottfried, Mark Jarman,

Michael Kreyling, Vera Kutzinski, Jonathan Lamb, Leah S. Marcus, Dana Nelson,

John F. Plummer III, Hortense Spillers, Cecelia Tichi, Mark A. Wollaeger

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Dahlia Porter, Nancy Reisman, Rachel Teukolsky

WRITERS IN RESIDENCE Peter Guralnick, Alice Randall, Sandy Solomon

DEGREES OFFERED: *Master of Arts, Master of Arts in Teaching, Master of Fine Arts, Doctor of Philosophy*

✦ THE graduate program in English offers course work and research supervision in all areas of British and American literature, Anglophone literature from other countries, film, cultural studies, and literary theory. The goal of the Ph.D. program is to produce scholars, critics, and teachers of literature and culture for colleges and universities.

Applicants must submit scores on the General Test of the Graduate Record Examination.

Requirements for the master's degree include 24 hours of course work and a thesis at the end of the M.A. year.

Requirements for the M.F.A. include 42 to 48 hours of course work, a thesis of creative work (a novel, a book of short stories, a collection of poems, or a collection of personal essays), plus an oral defense of the thesis.

Requirements for the Ph.D. include at least 52 hours of course work, Ph.D.-level proficiency in a foreign language, comprehensive examinations, and a dissertation.

Through the Combined B.A./M.A. (4+1) Option, the Department of English offers exceptional students the opportunity to earn both the B.A.

and the M.A. in five years. Students will be provisionally admitted to the 4+1 program only by approval of the department. Further information about the program is available from the director of graduate studies.

Other regulations governing graduate work are available from the director of graduate studies. For more information on the M.F.A., see the Academic Programs chapter of this catalog.

Graduate seminars in creative writing may be repeated for credit with the program director's approval. Other graduate seminars may be repeated for credit if topics are not duplicated.

- 301. Seminar in Middle English Literature.** [4] (Not currently offered)
- 302. Seminar in Chaucer.** [4] (Not currently offered)
- 303. Graduate Fiction Workshop.** [May be repeated for credit with the program director's approval] FALL, SPRING. [4] Reisman, Lopez.
- 304. Graduate Poetry Workshop.** [May be repeated for credit with the program director's approval] FALL, SPRING. [4] Daniels, Hilles.
- 305. Graduate Nonfiction Workshop.** [May be repeated for credit with the program director's approval] SPRING. [4] Guralnick.
- 306. Seminar in Sixteenth-Century Literature.** [4] (Not currently offered)
- 307. Literature and the Craft of Writing.** [May be repeated for credit with the program director's approval] FALL. [4] Daniels.
- 310. Seminar in Shakespeare.** FALL. [4] Schwarz.
- 312. Seminar in Seventeenth-Century Literature.** [4] (Not currently offered)
- 314. Seminar, 1660–1800.** [4] (Not currently offered)
- 316. Seminar in Romantic Prose and Poetry.** [4] (Not currently offered)
- 318. Seminar in Victorian Prose and Poetry.** [4] (Not currently offered)
- 320. Studies in American Literature.** FALL. [4] Goddu.
- 321. Studies in Southern Literature.** SPRING. [4] Kreyling.
- 325. Seminar in Modern British and American Literature.** [4] (Not currently offered)
- 326. Introduction to Literary Modernism.** [4] (Not currently offered)
- 330. Seminar in the Enlightenment and Its Literary Connections.** [4] (Not currently offered)
- 337a. Introduction to Literary Theory.** [4] (Not currently offered)
- 337b. Introduction to Literary Theory.** [4] (Not currently offered)
- 350. Special Problems in English and American Literature.** May be repeated. [Variable credit: 1–4]
- 355. Special Topics in English and American Literature.** FALL, SPRING. [4] Schachter, Spillers, Neill, Young, Clayton, Kutzinski, Enterline/Tichi.
- 369. Master's Thesis Research.**

370. Master of Fine Arts Thesis Research. SPRING. [8] Staff.

371. Teaching Composition and Literature. A five-year professional development program intended to prepare students to teach English at the college level. Required of and limited to graduate students on appointment in the English department. [3] (Not currently offered)

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

399. Ph.D. Dissertation Research.

3995. Half-time Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

Environmental Engineering

CHAIR David S. Kosson

DIRECTOR OF GRADUATE STUDIES James H. Clarke

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David S. Kosson, Sankaran Mahadevan, Frank L. Parker, Charles W. Powers,
Karl B. Schnelle Jr.

PROFESSORS OF THE PRACTICE James H. Clarke, Sanjiv Gokhale

ASSOCIATE PROFESSORS John C. Ayers, Alan R. Bowers, Eugene J. LeBoeuf

ASSISTANT PROFESSORS Caglar Oskay, Harold S. Park, Florence Sanchez,
Kaye Savage, Luoyu R. Xu

RESEARCH ASSISTANT PROFESSORS Edsel B. Daniel, James P. Dobbins,
Andrew C. Garrabrants, Leslie M. Shor

DEGREES OFFERED: *Master of Science, Doctor of Philosophy*

✎ THE master's degree in environmental engineering may be earned through (a) the regular program that includes 24 hours of class work plus a thesis or (b) a non-thesis program requiring 30 hours of class work. There are 18 hours of required course work plus an additional 3 hours required for the non-thesis program. Remaining course work consists of elective courses.

The Ph.D. program requires all of the courses required for the non-thesis master's degree plus an additional 3-hour math requirement and 6 hours of electives related to the dissertation topic as approved by the dissertation committee. A minimum of 39 hours of formal course work and a dissertation are required. In addition, all Ph.D. candidates must pass a comprehensive exam after completing the 18-hour core curriculum. No foreign language is required.

The Master of Engineering, an advanced professional degree for engineers, is offered by the School of Engineering.

Civil Engineering

252a–252b. Civil and Environmental Engineering Seminar. A two-part seminar series designed to introduce students to current technical and professional issues through literature discussions, seminars by faculty and practicing engineers, and participation in panel discussions. FALL, SPRING. [1–1]

259. Geographic Information Systems. Principles of computerized geographic information systems (GIS) and analytical use of spatial information. Integration with global positioning systems (GPS) and Internet delivery. GIS software utilization and individual projects. SPRING. [3]

286. Construction Project Management. Introduction to the theory and application of the fundamentals of construction project management. The construction process and the roles of professionals in the process. Broad overview of the construction project from conception through completion. Application of management practices including planning, directing, cost minimizing, resource allocation, and control of all aspects of construction operations and resources. Prerequisite: CE 235 or consent of instructor. FALL. [3]

287. Construction Estimation. Fundamentals of construction estimating. Estimation of material, labor, and equipment quantities, including costing and pricing of projects. Application of estimating practices using real-world examples and project estimating software. Corequisite: CE 286. FALL. [3] Gokhale.

288. Construction Planning. Fundamentals of construction planning and scheduling. Application of management practices including process planning; directing, costing; resource allocation; and controlling all aspects of construction operations and resources, from pre-construction through operation and maintenance. Use of real-world examples and project scheduling software. Prerequisite: CE 286 and CE 287. SPRING. [3] Gokhale.

290. Reliability and Risk Case Studies. Review of case studies involving successes and failures in managing reliability and risk assessment of engineering systems from a wide range of perspectives, including design, production, operations, organizational culture, human factors, and exogenous events. Analysis of event consequences in terms of public health and safety, the environment and business continuity, and the implications on regulation, legal liability, and business practices. Evaluation of mitigation strategies based on achievable goals, technical and political feasibility, and economic impact. Cases drawn from natural disasters, industrial accidents, and intentional acts. Prerequisite: junior standing or consent of instructor. FALL. [3] Abkowitz.

291. Construction Materials and Methods. Implications of design realities, material specifications, code limitations, and regulations on the construction process. Natural and man-made materials, construction techniques, and other issues that impact quality, constructability, and life-cycle assessment. Prerequisite: senior standing. SUMMER. [3]

307. Finite Element Analysis. Discrete modeling of problems of the continua. Mathematical basis of finite element method—weighted residual and variational concepts. Finite element formulations—displacement, force, and mixed methods. One-D problems of the continua and finite element solution—C0 and C1 elements, eigenvalue and transient problems. Error checks and control. Mapping, shape functions, numerical quadrature, and solution of equations. Finite element formulation of two-dimensional problems (single and multi-field)—mapping and shape functions, triangular and quad elements with straight or curved boundaries. Application problems in 1-D, 2-D, and 3-D. Three-D elements, singular problems, and elements of buckling and nonlinear problems. Error estimation and quality control. Computer implementation. Commercial packages. FALL. [3]

310. Probabilistic Methods in Engineering Design. (Also listed as MT 312) Applications of probabilistic methods in the analysis and synthesis of engineering systems. Review of basic probability concepts, random variables and distributions, modeling and quantification of uncertainty, testing the validity of assumed models, linear regression and correlation analyses, Monte Carlo simulation, reliability analysis and reliability-based design. FALL. [3]

311. Engineering Design Optimization. Methods for optimal design of engineering systems. Optimization under uncertainty, reliability-based design optimization, robust design, multidisciplinary problems, multi-objective optimization. Discrete and continuous design variables, advanced numerical algorithms, and formulations and strategies for computational efficiency. Practical applications and term projects in the student's area of interest. Prerequisite: Math 287, Math 288 or CS 257, CE 310. [3] (Offered on demand)

313. Advanced Reliability Methods. Computational methods for probabilistic analysis and design of modern engineering systems. Emphasis on system reliability, nonlinear reliability methods, Weibull analysis, Bayesian methods, response surface modeling and design of experiments, advanced simulation and variance reduction concepts, sensitivity analysis and reliability-based design optimization. Practical applications using existing software. SPRING. [3]

359. Emerging Information Systems Applications. (Also listed as MT 359) An introduction to emerging information systems technologies and their role in improving productivity and efficiency in managing engineering operations. Design of integrated approaches to enhance the speed, accuracy, reliability, and quantity of information available for decision support. Emphasis on case studies of innovative applications in transportation and manufacturing, leading to individual and group projects requiring new product development. FALL. [3]

371a–371b. Reliability and Risk Engineering Seminar . Seminars by expert speakers will provide a wide range of perspectives on reliability and risk assessment and management of multidisciplinary engineering systems. Topics on infrastructure and environmental systems; mechanical, automotive, and aerospace systems; network systems (power distribution, water and sewage systems, transportation, etc.); manufacturing and construction; and electronic and software systems. FALL, SPRING. [1–1]

Environmental Engineering

260. Solid and Hazardous Waste Management. Solid municipal and hazardous waste management including generation, characterization, collection, treatment, and disposal. Legal requirements, risk assessment and management, costs and policy considerations; pollution prevention, recycling, and substitution. [3] (Offered on demand)

262. Hydrology. The hydrologic cycle, study of precipitation, evapotranspiration, hydrometeorology, stream flow, flood flow, flood routing, storm sewer design, detention basin design, and water quality. Prerequisite: CE 203, CE 277. FALL. [3]

264. Environmental Assessments. Design and conduct of environmental assessments to evaluate risks posed by infrastructure systems or environmental contamination. Impact analyses for sources, infrastructure modifications, due diligence environmental audits, and contaminated site remedial investigations. FALL. [3]

269. Radiological Aspects of Environmental Engineering. Characterization and detection of environmental radiation; biological effects of radiation; hazards, control, and disposal of radioactive wastes; use of radioactive tracers in environmental studies. SPRING of alternate years. [3]

270. Environmental Thermodynamics, Kinetics, and Mass Transfer. Examination of fundamental environmental processes and phenomena which provide the analytical tools necessary to solve a broad range of environmental problems. These tools include equilibrium phenomena, process rate and mass transport phenomena. FALL. [3]

271. Environmental Chemistry. Theoretical aspects of physical, organic, and inorganic chemistry applied to environmental engineering. Estimation of chemical parameters based on thermodynamic and structural activity relationships, kinetics of chemical reactions, equilibrium processes in the environment, including the carbonate system, metal complexation and precipitation. FALL. [3]

272. Biological Unit Processes. Principles of biology and their application to wastewater treatment processes with emphasis on microbial ecology, bioenergetics, and the role of chemical structure in biodegradability. Utilization kinetics of inhibitory and non-inhibitory organic compounds. Biological process analysis and design (aerobic and anaerobic) for municipal and industrial wastewaters, using a mass balance approach. SPRING. [3]

273. Environmental Characterization and Analysis. Introduction to the acquisition and interpretation of environmental data. Principles of chemical measurement, sample collection and sample program design; laboratory safety and good laboratory practices; analytical instrumentation and methods; quality assurance and quality control; and statistical interpretation of data. Hands-on experience is gained in combination with demonstrations featuring state-of-the-art analytical instrumentation. SPRING. [3]

274. Surface Water Quality Modeling. Physical, chemical, biological, and physiological processes in streams, lakes, estuaries, and surface water/groundwater interfaces. Analytical and numerical modeling techniques. One- and two-dimension computer simulation of surface water quality. Prerequisite: 270 or equivalent. SPRING. [3]

276. Groundwater Hydrology. The occurrence and flow of groundwater. Basic concepts of the effects of varying permeability and capillarity on seepage flow. Flow toward wells, through dikes, and beneath dams. Students cannot receive credit for both ENVE 276 and Earth and Environmental Sciences 257. SPRING. [3]

277. Physical/Chemical Unit Processes. Principles of mass transfer, chemistry, and chemical reactor technology applied to the design and operation of water and wastewater treatment processes. Unit processes such as coagulation/flocculation, sedimentation, filtration, carbon adsorption, ion exchange, air stripping, precipitation, chemical oxidation, and chemical reduction will be evaluated as alternatives for the treatment of drinking water and industrial wastewaters. SPRING. [3]

280. Atmospheric Pollution. Fundamentals of atmospheric pollution and control. The sources and nature of gaseous and particulate air pollutants, the relation of meteorological conditions to their dispersal, and their effects on health and materials are discussed along with administration, standards, and control of air pollution. SPRING. [3]

296. Safety, Security, and Environmental Risk Management. Development of safety and security programs for protecting human health, the environment, and business continuity. Focus on defining an all-hazard risk management process and program implementation, performing risk assessments, determining and selecting appropriate risk reduction strategies, and influencing risk management decisions internally and externally. Applications drawn from natural disasters, man-made accidents, and intentional acts. Prerequisite: senior standing or consent of instructor. SPRING. [3]

312. Pollutant Transport in the Environment. An introduction to the mathematical foundations of fluid mechanics and transport of pollutants in the environment. Fundamental conservation of mass, momentum, and energy equations will be developed. Appropriate initial and boundary conditions and solution techniques will be discussed for a number of applications. [3]

325a–325b–325c. Individual Study. Literature review and analysis, or laboratory investigation, of special problems under faculty supervision. FALL, SPRING, SUMMER. [Variable credit: 1–4 each semester]

369. Master's Thesis Research.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

389. Master of Engineering Project. Not for M.S. or Ph.D. students. [0]

399. Ph.D. Dissertation Research.

Environmental Management

✂ THE Environmental Management Program offers guidance and support for the interdisciplinary study of environmental engineering, business, law, technology, and policy issues. The program's goal is to educate current and future leaders in industry, government, and academia in these vital areas. The program is coordinated through the Vanderbilt Center for Environmental Management Studies (VCEMS), which brings faculty members and students together from various disciplines for collaborative study and research on topics such as risk assessment, management, and communication; organizational design and strategy; sustainability; environmentally conscious manufacturing; waste management; and global environmental issues. Participating faculty include Mark Abkowitz (Civil and Environmental Engineering), James Clarke (Civil and Environmental Engineering), Mark Cohen (Management), David Furbish (Earth and Environmental Sciences), David Kosson (Civil and Environmental Engineering), Frank Parker (Civil and Environmental Engineering), Michael Stabin (Radiology and Radiological Sciences), and Michael Vandenberg (Law).

There are several options for students interested in pursuing the master's or Ph.D. degree in environmental management and related areas. For further details, contact Professor Clarke at james.h.clarke@vanderbilt.edu and visit the VCEMS Web site at www.vanderbilt.edu/VCEMS.

French and Italian

CHAIR Lynn Ramey

DIRECTOR OF GRADUATE STUDIES Robert Barsky

PROFESSORS EMERITI Barbara C. Bowen, Dan M. Church, James Patty, Patricia A. Ward,
Ruth G. Zibart

PROFESSORS Robert Barsky, Marc Froment-Meurice, Tracy Sharpley-Whiting

ASSOCIATE PROFESSORS William Franke, Anthère Nzabatsinda, Lynn Ramey,
Virginia M. Scott, Holly A. Tucker

ASSISTANT PROFESSORS Nathalie Debrauwere-Miller, Andrea Mirabile

SENIOR LECTURERS Patricia Armstrong, Tracy Barrett, Elsa Filosa, Susan Kevra,
Martine Prieto, Mary Beth Raycraft, Nathalie Dieu-Porter

DEGREES OFFERED: FRENCH. *Master of Arts, Doctor of Philosophy*

✦ REQUIREMENTS for the master 's degree include 36 hours of course work, all of which may be taken in the Department of French and Italian. French 300 and 310 are required as part of the 36 hours. Courses may be taken outside the department or a minor may be completed with the approval of the director of graduate studies. There is no thesis. A comprehensive examination, based on a departmental reading list, must be taken no later than the second week of the student's fourth semester of study.

Requirements for the Ph.D. include at least 51 hours of course work, including fourteen courses in French at the 300-level, of which six must be literature seminars distributed among six different time periods. Students are expected to begin to register for research credit no later than their fifth semester of study. Up to 21 hours may be taken as research credit. Of the required 51 hours of course work, 9 hours will be taken in a minor field. An integrated minor of 12 hours outside the department is required for students writing dissertations in the field of second language acquisition. Students are required to take French 300 and 310 during their first year of study. During the second or third year of study, they must take one course in each of the following categories:

Language/Linguistics: French 302 (required for any student specializing in medieval or Renaissance literature), French 318 (required for any student specializing in second language acquisition).

Literary Theory and Criticism: French 380 or an equivalent course outside the department, by permission of the director of graduate studies.

In addition to French and English, doctoral candidates must demonstrate a reading knowledge of a foreign language appropriate to the area of specialization. However, it is strongly recommended that students have a reading knowledge of both Latin and German. Other regulations governing graduate work are available from the director of graduate studies.

The Jean and Alexander Heard Library's rich collection of French materials makes research possible in all periods of French literature. The

library's special collections department also houses the W. T. Bandy Center for Baudelaire and Modern French Studies, the Pascal Pia collection (nineteenth- and twentieth-century literary criticism), the Gilbert Sigaux collection (twentieth-century French theatre), and the Wachs collection (eighteenth-century fiction and almanacs).

French

300. Introduction to Research. Materials and methods of scholarly research, with attention to their relation to theories of literature. SPRING. [3]

302. History of the French Language: Medieval Period. Syntax, morphology, phonology, emphasis on textual explication. Prerequisite: elementary knowledge of Latin. [3] Ramey.

310. Foreign Language Learning and Teaching. (Also listed as German 310, Portuguese 310, and Spanish 310) Principles and practices of teaching a second language, with concentration on recent interactive and communicative models of foreign language instruction. Goals of the course are 1) to introduce principles of Second Language Acquisition and learning, 2) to critically read relevant literature in the area(s), and 3) to develop FL instructor's awareness through reflective and critical thinking. Classroom observations, journal writing, development of materials, and a small action-research project are expected. Required of all entering teaching assistants. FALL. [3] Scott.

312. Second Language Acquisition Theories and Research. A review of current socio-cultural and cognitive theories and research in SLA. In addition to common readings, students will explore a wide range of journals and professional organizations in the field and develop an empirical research project. [3] Scott.

318. Applied French Linguistics. Phonetics, morphology, syntax, and semantics, with application to teaching; theories of second language acquisition. Prerequisite: Linguistics 201 or its equivalent. [3] Scott.

332. Seminar in Medieval French Literature. [3] Ramey.

338. Seminar in Sixteenth-Century French Literature. FALL. [3] Ramey.

342. Seminar in Seventeenth-Century French Literature. [3] Tucker.

353. Seminar in Eighteenth-Century French Literature. [3]

362. Seminar in Nineteenth-Century French Literature. SPRING. [3] Froment-Meurice.

372. Seminar in Twentieth-Century French Literature. [3] Debrauwere-Miller.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0-12]

380. French Literary Theory. Literary theory as it has been shaped by and shapes the French tradition. SPRING. [3] Barsky.

388. Seminar in Francophone Literature. Literature of the French-speaking world ("La Francophonie"). [3] Nzabatsinda.

394. Special Topics in French Studies. Problems, themes, or issues in literature, language, or culture approached in ways that transcend traditional chronological distinctions. FALL. [3] Barsky.

399. Ph.D. Dissertation Research.

3995. Half-time Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

Gender Studies

See Women's and Gender Studies

Germanic and Slavic Languages

CHAIR Dieter H. Sevin

DIRECTOR OF GRADUATE STUDIES Christoph Zeller

PROFESSORS Barbara Hahn, John A. McCarthy, Dieter H. Sevin

ASSOCIATE PROFESSORS Konstantin V. Kustanovich, David A. Lowe, Meike G. Werner

MELLON ASSISTANT PROFESSOR Margaret Setje-Eilers

ASSISTANT PROFESSORS Sara Figal, Angela Lin, Christoph Zeller

MAX KADE VISITING PROFESSOR Justus Fetscher

DEGREES OFFERED:

GERMAN. *Master of Arts, Doctor of Philosophy*

✳ GRADUATE studies in German at V anderbilt lead to the M.A. and the Ph.D. The program leading to the M.A. degree is designed primarily to deepen and broaden the student's knowledge of German literature from its beginnings to the present day, with special emphasis on major areas not usually covered in-depth in an undergraduate course of study. The program is also intended to lay the groundwork for possible continuing study toward the Ph.D.

Candidates for the master's degree must meet three separate requirements: complete 30 hours of formal course work, submit written evidence of research abilities, and pass an oral examination based on course work and the departmental core reading list. Nine of the 30 hours are to be at the 300 level in the department, and a minimum of 3 hours should be in a graduate seminar (i.e., numbered 386–391). Up to 6 credit hours may be transferred from outside the university. The oral examination is normally taken at the end of the student's third semester. As a rule, independent study will not fulfill the requirement of formal course work. Evidence of research abilities will usually take the form of a research paper of twenty-five to thirty pages that is based on a term paper and is to be submitted no later than the end of the student's fourth semester at V anderbilt. As an alternative, students may choose to complete 24 hours of formal course work and to write a master's thesis. The latter is a research paper of sixty to eighty pages in length that gives evidence of scholarly competence and

independent, critical thought. The research-writing requirement for this latter option is satisfied after the formal course work and the oral examination have been completed.

The department expects candidates to meet all formal course requirements for the master's degree within three semesters. The student must maintain a minimum *B* average, provide evidence of scholarly research abilities, and pass the oral examination to receive her/his degree. The M.A. examination committee consists of three faculty members drawn from the department; usually—but not necessarily—the chair or the director of graduate studies serves as one of the examiners.

In order to be admitted to candidacy for the Master of Arts degree, a student is required to prove ability in writing and speaking German to the satisfaction of the department.

All candidates awarded a Teaching Assistantship will enroll in Foreign Language Teaching Theory and Practice during their first term of teaching. The student arranges her/his program in consultation with the director of graduate studies and in recognition of departmental objectives.

Doctor of Philosophy

Admission to the program does not imply acceptance for candidacy in the Ph.D. program. Performance well above the minimum Graduate School requirement of a *B* is expected for admission to the Ph.D. program. Candidates normally obtain the M.A. before going on for the Ph.D. The purpose of the doctoral degree at Vanderbilt is to develop the talented candidate's capacity to make independent contributions to the field of German literature and cultural studies. Transfer students should consult the Graduate School requirements for the doctorate.

The Ph.D. degree requires at least two academic years of graduate study beyond the master's degree. A total of 72 credits beyond the B.A. degree is mandated by the Graduate School, thus 42 credits beyond the M.A. at Vanderbilt are necessary. A minimum of 36 of these hours are done in formal course work; most should be at the 300 level with a minimum of 12 required seminar hours. Moreover, at this advanced level of study the candidate will have considerable latitude in developing a focus (9 hours) in a related discipline or in crossdisciplinary studies relevant to Germanics, for example, in comparative literature, critical theory, philosophy, political science, or history. The department encourages students of German to incorporate an interdisciplinary dimension into their doctoral work that might include the philosophy of language, political and social history, women's writing and the production of culture, censorship practices, or the impact of philosophy on aesthetic concepts and forms. Students completing a dissertation have the option under certain conditions of enrolling in 3995, half-time research (maximum of six years).

The director of graduate studies in German assists in devising related areas of concentration so that the student, at this stage, can be narrowing her/his focus for a dissertation topic. Faculty members actively assist students to determine the most promising topics for innovative research by

pointing out interesting knowledge gaps, theoretical issues, or interdisciplinary questions.

A reading knowledge of French is usually expected, but another language may be substituted with the approval of the examination committee if it is felt that this language is relevant to the candidate's area of concentration or dissertation research. The second language requirement must be fulfilled before the candidate may take the comprehensive examination.

The teaching program option offers up to 12 credit hours in the area of teaching methodology (courses, research projects, and teaching internships). Work in this area does not count toward minimum degree requirements; 4 hours is normally the minimum in this program. Students opting for the full program should expect to add at least one semester to their course of study.

German

213–214. German Conversation and Composition. Graduate credit for M.A.T. candidates only. Prerequisite: 103. FALL, SPRING. [3–3] Lin, Sevin.

216. Business German. The culture of the German business community; differences that hinder communication between German-speakers and non-German-speakers in the business setting; development of aural/oral and written skills. Business practices, policies, and laws in German-speaking countries; advertising and marketing strategies, letters, vitae, phone calls, and personal interviews. Graduate credit for M.A.T. candidates only. SPRING. [3] Setje-Eilers.

220. Advanced Grammar. Study of word formation and sentence structure in modern German, supplemented by contemporary readings, with discussion. Not open to students who have participated in the Regensburg exchange program. Graduate credit for M.A.T. candidates only. [3] Setje-Eilers. (Not currently offered)

221–222. German Culture and Literature. Introduction to major periods and genres of German cultural production from the middle ages to the present; overview of major social and political developments. Literary, philosophical, and other texts. Readings and discussions in German. Graduate credit for M.A.T. candidates only. FALL, SPRING. [3–3] Setje-Eilers, Zeller.

235. German Romanticism. The contributions of Schlegel, Tieck, Novalis, Eichendorff, and others to literature, philosophy, and theory. Intellectual, social, and political currents. [3] Lin. (Not currently offered)

237. Women and Modernity. Women in German literature from the eighteenth century to the present, focusing on questions of sexuality, political emancipation, artistic identity. No knowledge of German required. [3] Werner. (Not currently offered)

238. Interconnections of Arts and Science: Goethe and the Natural World. (Also listed as Physics 238) Mutual influences between the arts and science, as exemplified in Goethe's *Faust* and *Elective Affinities*. Readings in English, with option of German readings for German Studies majors. Focal points: empirical investigation, philosophical interrogation, and scientific explanation. Prerequisite: completion of Basic Science requirement. [3] Haglund (Physics), McCarthy. (Not currently offered)

241. The Racial Imagination. The complex and contradictory history of the idea of "race" as a scientific category. Study of medical, scientific, philosophical, anthropological, and literary texts. No German required. [3] Figal. (Not currently offered)

- 243. The Aesthetics of Violence: Terror, Crime, and Dread in German Literature.** The “dark” side of imagination in twentieth-century German literature including history and theory of modern art, emphasis on literary representation, mutual influences between aesthetic reflection and political action. No knowledge of German required. [3] Zeller. (Not currently offered)
- 244. German Fairy Tales: From Brothers Grimm to Walt Disney.** The German fairy tale tradition and its role in American culture. No knowledge of German required. FALL. [3] Figal.
- 245. Love and Friendship.** Concepts of life and friendship, Greek antiquity to Romanticism, modern and postmodern times. Philosophical and literary texts, letters, and essays. No knowledge of German required. [3] Hahn. (Not currently offered)
- 246. German Masterpieces in English Translation.** Emphasis on the classical period and the present. Authors such as Goethe, Grass, Hesse, Kafka, T Mann, and Schiller. No knowledge of German required. [3] (Not currently offered)
- 248. German Lyric Poetry—Form and Function.** Lyric forms as a reaction to personal trauma, collective desire, scientific and technological advances, and social change since the Thirty Years’ War. Love, loss, liberation. Students compose poems in imitation of classic examples of the folk song, ballad, sonnet. SPRING. [3] Lin.
- 262. German Literature of the Middle Ages.** Examines sites of literary production (monasteries, courts, urban centers) and the evolution of literary language. [3] Werner. (Not currently offered)
- 263. The Age of Goethe—Weimar 1775 to 1805.** Rational pragmatism, aesthetic innovation in response to Kant and French Revolution. Readings drawn from Goethe’s *Iphigenia*, *Hermann und Dorothea*, Schiller’s *Maria Stuart* and *Wallenstein*, and Wieland’s *Oberon*. [3] McCarthy. (Not currently offered)
- 264. Pleasures and Perils in Nineteenth-Century Theater.** The German drama and dramatic theory from Romanticism up to Naturalism with emphasis on selected works by Kleist, Büchner, Grillparzer, and Hebbel. [3] Setje-Eilers. (Not currently offered)
- 265. Revolutionizing Twentieth-Century Theater.** German drama and dramatic theory from Naturalism to the present. Emphasis on Brecht and post-Brechtian drama. FALL. [3] Zeller.
- 266. Nineteenth-Century Prose.** A study of representative works of the main literary trends from Romanticism to Naturalism. [3] (Not currently offered)
- 267. The German Novel from Kafka to Grass.** A study and interpretation of the main literary trends and major figures in twentieth-century narrative. [3] Sevin. (Not currently offered)
- 268. Modern German Short Story.** From 1945 until the present, including such authors as Ilse Aichinger, Heinrich Böll, Wolfgang Borchert, Ingeborg Bachmann, and Alexander Kluge. [3] (Not currently offered)
- 269. Writing under Censorship.** An introduction to the main literary trends and authors of the former East Germany (1949–1989). Taught in German. FALL. [3] (Not currently offered)
- 270. German Cinema: Vampires, Victims, and Vamps.** An analysis of representative German film with special emphasis on its sociocultural and historical context. Discussion will include pertinent theories of cinematography and cinematic narration. Taught in English. SPRING. [3] Sevin.
- 271. Women at the Margins: German-Jewish Women Writers.** Examination of themes, forms, and sociocultural issues shaping the work of German-Jewish women writers from the

Enlightenment to the present. Readings and discussions in English. SPRING. [3] (Not currently offered)

273. Nazi Cinema: The Manipulation of Mass Culture. Nazi manipulation of mass culture through film (propaganda, musicals, westerns). Some comparison with American film of the era, additional examination of “fascist” aesthetic legacy in American culture today. No German required. FALL. [3] Figal.

274. Who Am I? German Autobiographies. Canonical and non-canonical texts from the nineteenth and twentieth centuries constructing cultural, religious, and gender identities. SPRING. [3] Hahn.

275. Art and Rebellion: Literary Experiment in the 1960s and 1970s. German literature under the conditions of protest and rebellion. Experiments in poetry, prose, and theater; new directions in art and media theory; historical influences. [3] Zeller. (Not currently offered)

278. Dreams in Literature. The difference between sleeping and being awake. Literary and philosophical texts. Novels, short stories, diaries, poems, and drama written within the last two hundred years. [3] Hahn. (Not currently offered)

280. Murder and Mayhem: The *Sturm und Drang*. *Sturm und Drang* literary and social movement (1767–1782). Literary genres and themes (e.g., infanticide, suicide, fratricide; primitivism, educational reform, utopian visions). Drawn from French (Diderot, Rousseau, Mercier) and English (Young, MacPherson, Shakespeare) impulses. The young Goethe and Schiller, Herder, Hamann, Lenz, L. Wagner. [3] McCarthy. (Not currently offered)

289a–289b. Independent Readings. Designed for majors and qualified undergraduates. Consists of a project to be carried out under the supervision of a member of the department. All projects must be approved by the department. [Variable credit: 1–3 each semester, not to exceed a total of 6 over a four-semester period, in both courses combined]

294a–294b. Selected Topics. Topics of special interest in language, literature, and culture, e.g., The Image of America in German Literature, German Exile Literature, Germany in the Twenties, Kafka, Brecht, Scientific Readings, Literature and Art in the Middle Ages, *Faust*, Austrian and Swiss Literature. Topics to be announced in the *Schedule of Courses*. [3–3, not to exceed a total of 12]

310. Foreign Language Learning and Teaching. (Also listed as French 310, Portuguese 310, and Spanish 310) Principles and practices of teaching a second language, with concentration on recent interactive and communicative models of foreign language instruction. Goals of the course are 1) to introduce principles of Second Language Acquisition and learning, 2) to critically read relevant literature in the area(s), and 3) to develop FL instructors' awareness through reflective and critical thinking. Classroom observations, journal writing, development of materials, and a small action-research project are expected. Required of all entering teaching assistants. FALL. [3] Scott.

312. Foreign Language Curriculum Development and Evaluation. (Also listed as French 312, Portuguese 312, and Spanish 312) Focus on planning, development, implementation, and evaluation phases of language teaching from a systematic curriculum development perspective. Students are expected to become conversant with the research literature in the area and work on curricular projects according to their interests. An important part of the course will be dedicated to program evaluation, including training in recognized instruments and procedures to analyze and interpret data. They are expected to produce a research-based curricular project. [3] (Not currently offered)

314. Bibliography and Methods. An introduction to German studies in the U.S., to the resources and practice of literary history and criticism. [3] McCarthy. (Not currently offered)

316. Literary Theory and Criticism. Selected problems of literary theory, history, and interpretation. [3]

329a. Teaching Program Option: Internship in Advanced Language and Literature Courses. Graduate interns participate in the teaching of advanced language or literature courses and receive training in the writing of syllabi, text selection, testing, the development of supplementary materials, the selection of visual aids. FALL, SPRING. [Variable credit: 1–2 each semester, not to exceed a total of 6]

330. Expressionism. The chief intellectual movement in Germany and Austria from 1910 to 1925. Topics include all genres of literature with frequent references to other disciplines including politics, the pictorial arts, and film. In German. [3] (Not currently offered)

335. Enlightenment and Its Literary Connections. (Also listed as English 330) Philosophy and literature in the age of reason; emphasis on aesthetic innovation and rise of the modern individual; authors include Locke, Kant, Richardson, and Lessing. [3] McCarthy. (Not currently offered)

340. Beyond Good and Evil. [3] McCarthy. (Not currently offered)

351. Philosophical Backgrounds of German Literature. Survey of German philosophical thinking from Leibniz to Nietzsche and its importance for German literature from Goethe to Hesse. [3] McCarthy. (Not currently offered)

369. Master's Thesis Research. [0]

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

385a–385b. Problems in Germanic Languages and Literatures. FALL. [3–3] Figal.

Graduate seminars in German explore individual authors, forms, theories, or works at an advanced level. Recent selections include Twentieth-Century Reception of Medieval Literature, Rise of the Author, Büchner, Kleist, Expressionism, Exile Literature, and Christa Wolf. Topics to be announced in the Schedule of Courses. May be repeated for credit.

387. Seminar: Studies in Medieval Literature. [3] (Not currently offered)

388. Seminar: Studies in Literature 1400–1680. [3] (Not currently offered)

389. Seminar: Eighteenth-Century German Literature. FALL. [3] McCarthy.

390. Seminar: Nineteenth-Century German Literature. FALL. [3] Sevin.

391. Seminar: Twentieth-Century German Literature. The Aesthetics of Violence. [3] Zeller.

392. Seminar: Problems of Theory in German Studies. Author, Archive, Work. [3] Hahn. (Not currently offered)

393. Seminar: Intellectual Constellations. SPRING. [3] Fetcher.

394. Seminar: Society and Ethics. [3] (Not currently offered)

395. The Racial Imagination. The complex and contradictory history of the idea of “race” as a scientific category. Study of medical, scientific, philosophical, anthropological, and literary texts. No knowledge of German is required. [3] Figal. (Not currently offered)

399. Ph.D. Dissertation Research.

3995. Half-time Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

Russian

Courses in Russian may be used as minor credit in graduate programs.

171–172. Russian Culture. The evolution of Russian civilization. The interplay between East and West in the shaping of Russian cultural achievements and national identity. No knowledge of Russian required. 171: From Kievan Russia to 1880. 172: From 1880 to the present. [3–3]. (Not currently offered)

221–222. Survey of Russian Literature in English Translation. Main currents, writers, and works of Russian literature. 221: the nineteenth century: Pushkin, Lermontov, Gogol, Turgenyev, Dostoevsky, and Tolstoy. 222: the twentieth century: Bulgakov, Pasternak, Solzhenitsyn, Aksenov, Trifonov, and Petrushevskaya. No knowledge of Russian required. [3–3] Lowe, Kustanovich. (Not currently offered)

223–224. Composition and Conversation. Development of all language skills at the intermediate-advanced level. Reading of contemporary short stories. Prerequisite: 204. FALL, SPRING. [3–3] Lowe, Kustanovich.

231. Jews in Russian Culture: Survival and Identity. A course on the history of Jewish contributions to Russian culture, including literature, the visual arts, theater, and film. Questions of assimilation, the rise of Jewish national consciousness, and interest in Jewish heritage are discussed. No knowledge of Russian required. [3] (Not currently offered)

232. The Evil Empire: Stalin's Russia. Life in Stalin's Russia as portrayed in memoirs, novels, stories, poetry, films, and music. No knowledge of Russian required. SPRING. [3] Lowe.

233. Crime and Punishment. Dostoevsky's psychological thriller *Crime and Punishment* and two kinds of related texts: those that influenced Dostoevsky's classic crime novel (works by Pushkin and Balzac) and those influenced, in turn, by Dostoevsky's novel (works by Nabokov and Trifonov). No knowledge of Russian required. [3] (Not currently offered)

234. The Russian Cinema. Socialist Realism of the 1930s to 1950s; masterpieces of the post-Stalin era in the 1960s and '70s; sex and violence of the Perestroika; new post-Soviet cinema. Films by such directors as Eisenstein, Pyryev, Romm, Tarkovsky, Mikhalkov, and Sokurov are studied and discussed within the political context. No knowledge of Russian required. FALL. [3] Kustanovich.

257–258. Advanced Composition and Conversation. Prerequisite: 224 or equivalent. [3–3] (Not currently offered)

289a–289b. Independent Readings. Consists of a project to be carried out under the supervision of a member of the department faculty. FALL, SPRING. [Variable credit: 1–3 each semester, not to exceed a total of 6 over a four-semester period, in both courses combined]

Hearing and Speech Sciences

CHAIR Fred H. Bess

DIRECTOR OF GRADUATE STUDIES Edward G. Conture

PROFESSORS EMERITI Judith Rassi, R. E. Stone Jr., Robert T. Wertz

PROFESSORS Daniel H. Ashmead, Fred H. Bess, Stephen M. Camarata, Edward G. Conture,
D. Wesley Grantham, Linda J. Hood, Gary P. Jacobson, Howard S. Kirshner, Gus Mueller,
Ralph N. Ohde, Robert H. Ossoff, Anne Marie Tharpe

CLINICAL PROFESSOR Gary A. Duncan

ASSOCIATE PROFESSORS Gene W. Bratt, Lee Ann Golper, Ellen Kelly, Todd A. Ricketts,
Teris K. Schery, Mark Wallace

ASSISTANT PROFESSORS Patricia F. Allen, Tamala Bradham, Candice Burger,
Mary N. Camarata, William Dickinson, Mary Sue Fino-Szumski, Troy Hackett, Sue Hale,
Devin McCaslin, Daniel Polley, C. Melanie Schuele, Wanda G. Webb

RESEARCH ASSISTANT PROFESSORS Benjamin W. Y. Hornsby, Alexandra Key,
Doug Sladen

ASSISTANT CLINICAL PROFESSOR John R. Ashford

DEGREE OFFERED: *Doctor of Philosophy*

✦ THE Ph.D. degree normally requires three years of study with a minimum of 72 graduate credit hours. There are no foreign language requirements; however, the student must complete two research projects and 12 hours of course work in statistics and research methodology prior to the dissertation. Doctoral candidates also present a minor of not less than 12 hours taken outside the department or from another subject area in hearing, speech, and language. The final year of the program is typically devoted to the dissertation.

This department also offers the Doctorate of Audiology (Au.D.), Master of Education of the Deaf (M.E.D.), and the Master of Science (in Speech-Language Pathology) through the School of Medicine (www.vanderbilt.edu/catalogs/medical).

The teaching, clinical, and research programs of the department are housed primarily in Vanderbilt's Bill Wilkerson Center. For further information, visit our Web site at www.mc.vanderbilt.edu/root/vumc.php?site=hearing.

206. Anatomy and Physiology of Speech and Hearing Mechanisms. The basic processes of speech production, acoustics, and perception. Neuroanatomy, anatomy, physiology, acoustics, and acoustic correlates of sound features. Intended for undergraduates and graduate students outside the Department of Hearing and Speech Sciences. SPRING. [3] Ohde.

217. Hearing Disorders and Assessment. An introduction to the major pathologies of the peripheral and central auditory system as well as the medical/surgical treatment of those pathologies, followed by an introduction to the equipment and procedures used to assess auditory function in patients of all ages. SPRING. [3] Hornsby.

300. Neurology of Speech and Language. The structure and function of the nervous system, with emphasis on the neural mechanisms of speech and language. Neurologic conditions producing speech and language disorders are surveyed. FALL. [3] Webb.

- 301. Acoustics and Perception of Speech and Speech Disorders.** An examination of the processes of speech production, acoustics, and perception. Emphasis on relevant literature and research techniques in speech science. FALL. [3] Ohde.
- 302. Hearing Science.** A discussion of basic acoustics as it applies to hearing science. Anatomy and physiology of the peripheral and central hearing mechanism and vestibular system. FALL. [3] Hackett.
- 303. Hereditary Hearing Loss.** Hereditary aspects of hearing loss in infants, children, and adults. Genetic bases of hearing loss, modes of inheritance, characteristics of syndromic and nonsyndromic hearing losses. Collaboration with geneticists and genetic counselors. Recent developments and issues in evaluating and managing patients with genetic hearing loss. FALL. [3] Hood.
- 304. Child Language Acquisition.** The components and processes of normal language development. Relation to social and cognitive aspects of child development. Survey of developmental psycholinguistic research. FALL. [2] Schuele.
- 305. Clinical Principles and Procedures.** Presentation and demonstration of clinical principles and procedures applicable in communication sciences and disorders. FALL. [3] Golper.
- 306. Child Language Disorders.** The language development of children of variant populations. Focus on description of populations, assessment techniques, and intervention strategies. Clinical applications of research in normal language acquisition. FALL. [3] Schuele.
- 307. Seminar: Topics in Childhood Language Disorders.** Current issues in normal language acquisition and clinical applications to variant populations. Content of seminar rotated. FALL. [2] Staff.
- 308. Language and Literacy in Children with Hearing Loss.** This course presents an overview of normal language acquisition and the challenges imposed by a hearing loss. A variety of methods and materials to develop oral and written language and reading will be included. Practical methods of assessment, supportive strategy development, and curricular adaptations for children with hearing loss will be explored. SPRING, SUMMER. [3] TBA
- 309. Practicum: Language and Literacy in Children with Hearing Loss.** This practicum provides opportunities for graduate students to incorporate information acquired from HRSP 308 into daily practice to acquire teaching skills and techniques upon which effective learning depends. Corequisite: HRSP 308. SPRING, SUMMER. [1] TBA
- 310. Measurement of Hearing.** The theory and practice of hearing measurement, with emphasis on routine clinical and screening audiometric techniques, testing environment, audiometric standards and calibration, applied impedance measurements, and interpretation of audiometric tests. FALL. [3] Dickinson.
- 311. Stuttering.** Significant research in the field of stuttering, with emphasis on etiology and therapy. The management of fluency disturbances. SPRING. [3] Conture.
- 312. Psychology and Culture of the Deaf.** Presentation and discussion of significant historical and current issues relating to the Deaf population. Primary focus will be on psychological development, educational/methodological models, and Deaf culture. Although the principal focus is on the psycho/social and cognitive/intellectual development of deaf individuals through the lifespan, a general survey of other areas of exceptionality is made with emphasis on the implications for the deaf child with additional disabilities and/or special needs. SUMMER. [2] TBA

- 314. Articulation Disorders and Clinical Phonetics.** The etiology, evaluation, and management of articulatory defects in children and adults. Prerequisite: consent of instructor. FALL. [3] Ohde.
- 315. Introduction to Autism Spectrum Disorders.** This class will provide an overview of normal social, play, linguistic, and cognitive development compared to the features and behavioral characteristics of autism spectrum disorders (ASD) and will introduce the student to causative factors and management approaches with ASD. [3] Hale, Wallace. (Not currently offered)
- 316. Motor Speech Disorders.** A study of the nature and treatment of the adult and childhood dysarthrias and dyspraxias of speech. Management of infants and young children at neurological risk for developing motor speech disability. Rights of the severely communicatively disabled. Prerequisite: 300 or consent of instructor. SUMMER. [2-3] Schneider.
- 317. Traumatic Brain Injury.** Pathophysiology of traumatic brain injury in children and adults; unique and common sequelae, the evaluation and treatment of cognitive/communicative deficits and special problems of the population. Prerequisite: 300 or 331 or consent of instructor. SUMMER. [3] Deriesthal.
- 318. Educational Audiology and Aural Habilitation for Children.** A survey of approaches to aural rehabilitation for children. Specific focus will be on intervention for children with hearing loss in educational and other habilitative settings. SPRING. [3] Tharpe.
- 319. Dysphagia.** The study of the normal and disordered swallow in pediatric and adult populations. Anatomy and physiology, videofluoroscopic and other assessment procedures, as well as various treatment alternatives and techniques are included. FALL. [3] Ashford.
- 320. Introduction to Amplification for Infants and Children.** Designed for deaf education and speech-language pathology students. Current issues and trends in conventional amplification for infants and children. Selection, fitting, verification, and validation of traditional amplification options will be addressed including directional vs. omnidirectional microphones, analogue vs. digital instruments, monaural vs. bilateral fittings, and real-ear measures vs. functional-aided gain. Hearing aid retention, maintenance, and troubleshooting techniques are addressed. FALL. [2] TBA
- 321. Seminar: Intervention for Pediatric Acquired Brain Injury.** Assessment and intervention techniques for cognitive/communicative and behavioral deficits associated with pediatric acquired brain injuries. Emphasis on effects on normal development, educational curricula modifications and teacher/family training. Prerequisite: 317 or permission of instructor. SUMMER. [2] Allen.
- 323. Early Assessment and Intervention Methods in Autism Spectrum Disorders.** The course addresses basic theories and principles associated with assessment and management of children with Autism Spectrum Disorders. Auditory characteristics, classroom structure, behavior management, communication strategies, social and peer interaction, and family-focused practices are also addressed. FALL. [3] Wallace.
- 324. Feeding and Swallowing Disorders in Children.** This course focuses on the assessment, diagnosis, and management of dysphagia in children including the role of the speech-language pathologist and multidisciplinary and family-centered, family-supported management. Prerequisite: 319. SPRING. [2] Ashford, Golper, Arvedson, Provo-Bell.
- 325. Pediatric Audiology.** Methods and procedures used in the evaluation of the auditory function and management of neonates, infants, and young children. Includes identification and intervention procedures. FALL. [3] Tharpe.

327. Hearing Loss and Speech Understanding. This course examines various factors that may affect the speech understanding of persons with hearing loss. The contribution to the unaided and aided speech understanding of persons with hearing loss of 1) subject factors, such as degree of hearing loss, and deficits in frequency and temporal resolution, and 2) environmental factors, such as, the level and type of background noise, reverberation and talker characteristics, will be examined. Methods for predicting speech understanding will also be discussed. SPRING. [3] Hornsby.

328. Psychoacoustics. Psychoacoustic theory and methods. Auditory perception in normally hearing and hearing impaired subjects. SPRING. [3] Hornsby.

330. Advanced Audiologic Evaluation I. Diagnostic audiometry principles and procedures, including acoustic reflex measures, speech audiometry, auditory brainstem response (ABR), and electrocochleography (ECoChG). Also, newborn auditory screening with ABR. Practicum required. SPRING. [3] Jacobson.

331. Aphasia. The study of aphasia in adults, including the neuroanatomical basis, etiologies, symptomatology, assessment, differential diagnosis, and treatment. SPRING. [3] Deriesthal.

332. Pathology of the Auditory System. Auditory pathologies resulting from genetic origin, disease, injury to the ear, and lesions of the nervous system. FALL. [3] Bratt.

334. Seminar in Neurogenic Communication Disorders. Research literature on the relationship between brain and speech-language performance, emphasizing current methodology for studying neurological speech and language disorders. Prerequisite: 300 or 331 or consent of instructor. FALL. [2] Staff.

335. Seminar in Augmentative Communication. The application of augmentative communication devices to patients with physical and/or cognitive disabilities. The various types of devices available, the techniques for selecting and applying these systems to individual patients, and specific information on how to achieve effective conversational use of such systems. FALL. [2] Webb.

336. Voicing Disorders. Theories of voice production, with emphasis upon underlying mechanisms that cause vocal defects. Procedures for group and individual management. SUMMER. [3] Ashford.

338. Research Methods in Communicative Disorders. Research techniques and procedures. Analysis of research examples from the literature. Study of design of experiment, data collection, statistical analysis, and presentation of research findings. FALL. [1] Camarata.

340. Amplification I. Background and development of the design of hearing aids, earmold acoustics, electroacoustic characteristics, performance standards and measurement techniques, clinical selection and evaluation procedures. SPRING. [3] Dickinson.

341. Seminar in Audiology. Significant literature in the field of audiology. Directed study in assigned subject areas. FALL, SUMMER. [2] Staff.

342. Seminar in the Neurobiology of Hearing and Multisensory Processes. Study at the doctoral level of the neural processes underlying auditory and multisensory perception. The course will focus on critical readings of recently published findings that emphasize the connection between plasticity, neural systems, and behavior. May be repeated for credit. Prerequisite: consent of instructor. FALL, SPRING. [Variable credit: 1–2] Polley, Wallace.

343. Hearing Conservation. A discussion of noise levels, OSHA guidelines, noise-induced hearing loss, and hearing protection in work and leisure activities. Industrial audiology including testing, training, and intervention protocols. SUMMER. [3] TBA

344. Administrative Issues in Communicative Disorders. A discussion of some of the important issues affecting the administration of programs in communication disorders. Emphasis on business management, marketing, financial management, third-party payors, grants and contracts, state and federal agencies, and fundraising. SUMMER OF EVEN-NUMBERED YEARS. [Variable credit: 2–3] Camarata.

345. Amplification II. Advanced topics in amplification including: advanced probe microphone techniques, single and multi-channel compression systems, analog and digital signal processing, and current and emerging prescriptive and fitting verification methods. FALL. [3] Ricketts.

346. Assessment of Vestibular Disorders. An in-depth approach to the assessment of the dizzy patient. Subject matter will include: anatomy and physiology of the peripheral and central vestibular, ocular motor and postural control systems; introduction to both electrical and video techniques for recording the vestibuloocular reflex; case history and bedside assessment of the dizzy patient, technique and interpretation of electronystagmography, rotational testing, computerized dynamic posturography and somatosensory responses; assessment of self-report dizziness handicap, falls risk assessment in the elderly and vestibular rehabilitation. Students will be expected to conduct practica outside the classroom. SUMMER. [3] Jacobson, McCaslin.

347. Management of Vestibular Disorders. This course will focus on interpretation and analysis of balance laboratory results in dizzy patients as well as treatment and therapy provided by other professionals. Subject matter will include: advanced concepts in central vestibular system physiology, peripheral and central disorders of the vestibular system and their clinical findings, introduction to imaging dizzy patients, disequilibrium of aging and risk of falls assessment, drug treatment of vertigo, surgical treatment of vertigo, and vestibular rehabilitation. FALL. [3] Jacobson, McCaslin.

348. Audiology in Education. (Also listed as Special Education 2600) Current issues and trends concerning the role of the audiologist in the public school setting. Emphasis on early identification and intervention, inservice education, amplification, and the roles of federal, state, and local agencies in providing services to the hearing-impaired school-age population. SPRING. [3] Fino-Szumski.

349. Laboratory: Audiology in Education. Demonstration and hands-on experience with personal and classroom amplification systems. Operation and troubleshooting of amplification systems commonly used in a classroom setting. Specifically, hearing aids, FM systems, assistive listening devices, vibr tactile devices, and cochlear implants will be demonstrated. Co- or prerequisite: SPED 2600 or HRSP 348. FALL. [1] Fino-Szumski.

351. Special Problems in Speech Pathology. Areas and problems not included in other courses in speech pathology, chosen to fit the students' interests and the needs of their programs. May be repeated to a total of 12 hours. FALL, SPRING, SUMMER. [Variable credit: 1–6] Staff.

352. Special Problems in Audiology. Areas and problems not included in other courses in audiology, chosen to fit the students' interests and the needs of their programs. May be repeated to a total of 12 hours. FALL, SPRING, SUMMER. [Variable credit: 1–4] Staff.

353. Auditory Prostheses. Design and evaluation of auditory prostheses for listeners with hearing loss. Theoretical and clinical considerations of cochlear and auditory brainstem implants as well as hearing aids from a prostheses perspective. SPRING. [3] Ricketts.

354. Cochlear Implants for Infants and Children. Current issues in the medical, audiological, speech/language, and educational management of children with cochlear implants. Emphasis on multidisciplinary team function. Intended for undergraduates in Deaf Education

and graduate students in Hearing and Speech Sciences. Prerequisite: 318. SPRING. [3] Tharpe.

357. Professional Issues in Communication Disorders. Examines various professional issues within the fields of speech-language pathology and audiology. For example, ethics, malpractice, quality improvement, marketing, reimbursement, multicultural sensitivity, and federal legislation. SPRING. [1] Hale.

361. Family-Centered Counseling and Interviewing. Examines the helping relationship in the clinical process, counseling theory relative to audiology and speech-language pathology practices, and principles and methods of effective clinical interviewing and counseling. SPRING, SUMMER. [1] Hale.

363. Hearing and Aging. A survey of major concepts in gerontology, including demographics, psychosocial aspects of aging, biology of aging, and clinical conditions of the older adult. Physiological changes within the aging auditory system, and clinical issues in audiological assessment and intervention with older hearing-impaired patients. SUMMER. [3] Rosenfeld.

369. Master's Thesis Research. [0]

371a–371b. Research Design and Statistical Analysis. Covers topics in research design and statistics for students preparing for research careers in hearing science, speech science, and communication disorders. Reviews mathematical bases for probability theory and statistical inference. Covers fundamental parametric and nonparametric statistical tests, with extensive discussion of research design in the context of analysis of variance. Presents statistical properties of psychophysical methods and signal detection theory. FALL, SPRING. [3–3] Ashmead.

373. Signals and Systems for Hearing and Speech Sciences. A hands-on laboratory course that concentrates on applications for communications science. The course covers: (1) the fundamentals of analog signals, including the Fourier transform and representation of signals in the time and frequency domains; (2) the fundamentals of analog systems (filters), including representation in the time and frequency domains and the analysis of signals that pass through systems; (3) an introduction to digital signals and digital systems, including digital filter design; and (4) an introduction to MATLAB, a powerful tool for understanding and implementing signals and systems. SUMMER of odd-numbered years. [3] Grantham.

375. Seminar in Medical Audiology. Advanced study at the doctoral level of the medical aspects of audiology and the relationship of audiology to otology and neuro-otology. May be repeated for credit. Prerequisite: consent of instructor. [Variable credit: 1–3] (Not currently offered)

377. Seminar in Speech Perception. The study of the processes and models underlying the perception of speech features. Relevant acoustic correlates for speech perception will be evaluated, and these properties will be emphasized through the generation of synthetic speech. The course will cover the contributions of speech perception research to our understanding of speech development, and language and hearing disorders. SPRING. [3] Ohde.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

380. Advanced Seminar in Speech Language Pathology. A doctoral-level course focusing on special topics of interest to faculty and students and based on recent research developments in speech pathology. May be repeated for credit. Prerequisite: consent of instructor. FALL, SPRING, SUMMER. [3] Staff.

381. Advanced Seminar in Language. A doctoral-level course focusing on special topics of interest to faculty and students and based on recent research developments in language. May be repeated for credit. Prerequisite: consent of instructor. FALL, SPRING, SUMMER. [3] Staff.

382a–382b. Seminar: Research in Audiology. An advanced study of research for the second-year doctoral student. Directed individual research culminating in oral presentation and a manuscript. Prerequisite: consent of instructor. [2–2] (Offered on demand)

383. Practicum Case Conference. This course includes attendance at weekly case conferences where clinical case studies will be presented. The grade for this class will include clinical performance and attendance. FALL, SPRING, SUMMER. [1] Hale and Ricketts.

384. Advanced Seminar in Audiology. A doctoral-level course focusing on special topics of interest to faculty and students based on recent research developments in audiology. May be repeated for credit. Prerequisite: consent of instructor. FALL, SPRING. [3] Staff.

385. Instrumentation for Hearing and Speech Sciences: Stimulus Generation, Measurement, and Calibration. A hands-on introduction to the principles and techniques of setting up equipment for hearing and speech perception experiments. Students are exposed to analog generators (noise generators, function generators, oscillators, computer-controlled digital-to-analog converters) processing devices (attenuators, filters, mixers, amplifiers), terminating devices (earphones, loudspeakers, analog-to-digital converters), and measurement devices (oscilloscope, voltmeter, spectrum analyzer). Students will learn to design and implement circuits involving these various devices, and to measure and calibrate various kinds of acoustic stimuli. FALL of odd-numbered years. [3] Grantham.

386. Instrumentation for Hearing and Speech Sciences: MA TLAB Programming with Real-Time Applications. An introduction to the standard MATLAB computing language in a Windows environment. Basic programming concepts including data types and storage, data input and output, conditional execution, iterative programming, and the use of functions. The goal is for the student to become sufficiently comfortable with MATLAB (and with the concept of programming languages in general) to develop programs to solve specific computational problems too tedious to solve by calculator. The last third of the course will be devoted to the application of MA TLAB programming to real-time laboratory problems. Prerequisite: 385. SPRING of even-numbered years. [3] Grantham.

387. Spatial Hearing. An advanced treatment of the perception by humans of auditory objects in space, including laboratory demonstrations. Topics include (1) binaural processing (lateralization, binaural detection); (2) localization and spatial resolution in the free-field; (3) auditory distance perception; (4) the precedence effect: localization in reverberant spaces; and (5) the central auditory nervous system: binaural pathways. FALL of even-numbered years. [3] Grantham.

388. Independent Study and Readings in Speech Pathology FALL, SPRING, SUMMER. [3]

389. Independent Study and Readings in Audiology. FALL, SPRING, SUMMER. [3]

398. Preliminary Doctoral Research. [0]

399. Ph.D. Dissertation Research.

3995. Half-time Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

History

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Devin Fergus, Catherine Molineux, Ole Molvig, Moses Ochonou, Rowena Olegario,
Frank Robinson, Edward Wright-Rios

VISITING ASSISTANT PROFESSOR Henning Grunwald

SENIOR LECTURERS Yollette T. Jones, Peter Lorge

LECTURER Mark Dalhouse

DEGREE OFFERED: *Doctor of Philosophy*

✂ THE Ph.D. degree program in history includes at least 45 hours of formal course work. A reading knowledge of one foreign language is required. Students specializing in continental European or Latin American history must demonstrate a reading knowledge of one or more additional languages essential to their research.

Certain courses offered by other programs and by the Vanderbilt Law School may be accepted for credit toward the degree. Additional details are available in the office of the director of graduate studies.

Students are generally expected to enroll in 300-level courses. However, a student may petition to take an enriched version of a 200-level course.

176. History of Christian Traditions. (Formerly 180) Christian traditions from the origins to the present. Such themes as Jewish origins, formation of a catholic tradition, church-state relations, and the social and cultural contents of changing Christian beliefs and practices. Serves as repeat credit for 180. SPRING. [4] Harrington.

206. Japan's Recent Past. (Formerly 250) Japanese culture and society from the 1930s to the present. Impact of war experiences on postwar Japan, and the political nature of cultural production. Serves as repeat credit for 250. [3] Igarashi. (Not currently offered)

213. Muhammad and Early Islam. (Formerly 257) Early Arabian society, Judaism and Christianity in Arabia; Muhammad and the birth of Islam, the conquests, Islamization, Arabization; Jewish influences in early Islam, the medieval Islamic world. Serves as repeat credit for 257. [3] Wasserstein. (Not currently offered)

222. Medieval and Renaissance Italy, 1000–1700. (Formerly 233) Transformation of Italy from “medieval” society to the “Renaissance.” Cultural, economic, and social developments,

especially connections among wealth, status, and patronage. Meaning and applicability of the term "Renaissance." Serves as repeat credit for 233. [3] Caferro. (Not currently offered)

223. Medieval Europe, 1000–1350. (Formerly 213) Economic expansion and the formation of national states; the medieval Church and the revival of learning in the twelfth and thirteenth centuries. Serves as repeat credit for 213. SPRING. [3] Caferro.

224. Renaissance Europe. (Formerly 214) The political, social, economic, and religious history of Europe from 1300 to 1500, with particular emphasis on the intellectual aspects of the early Italian Renaissance. Serves as repeat credit for 214. [3] Caferro. (Not currently offered)

225. Reformation Europe. (Formerly 215) The political, intellectual, and social conditions underlying the Protestant revolt. The Reformation of Luther, Calvin, Zwingli, Loyola, and other religious reformers considered within the context of the general developments of sixteenth-century history. Serves as repeat credit for 215. [3] Harrington. (Not currently offered)

226. Revolutionary Europe, 1789–1815. (Formerly 218) Political, cultural, and economic upheavals in the late eighteenth and early nineteenth centuries; the French Revolution and Napoleon, romanticism, and early industrialization. Emphasis on Britain, France, and Germany. Serves as repeat credit for 218. FALL. [3] Ramsey.

227. Nineteenth-Century Europe. (Formerly 220) Major political, social, economic, and cultural developments from 1815 to 1914. Serves as repeat credit for 220. [3] Ramsey. (Not currently offered)

228. Europe, 1900–1945. (Formerly 225) Political, socioeconomic, cultural, and colonial history of Europe from 1914 to the fall of Hitler. Serves as repeat credit for 225. FALL. [3] Grunwald.

229. Europe since 1945. (Formerly 226) Origins of the Cold War; political and social transformations, East and West; the breakup of colonial empires; ideological and military tensions; intellectual and cultural trends. Serves as repeat credit for 226. [3] (Not currently offered)

230. Twentieth-Century Germany. (Formerly 231) The turbulent history of Germany, as it went from authoritarian state to volatile democracy, to National Socialist dictatorship, to divided country, and to reunification. Special emphasis placed on the Nazi dictatorship, its origins and legacy. Serves as repeat credit for 231. FALL. [3] Grunwald.

231. France: Renaissance to Enlightenment. (Formerly 234) Social and cultural history from 1515 to 1774. The conditions of life, ambitions, ideas, and tastes of the various social groups in France. The development of the arts, music, and literature in a social and political context. Serves as repeat credit for 234. [3] Crawford. (Not currently offered)

234. Modern France. (Formerly 235) From the French Revolution of 1789 to the present. Emphasis on politics, with some attention to major economic, social, cultural, and intellectual developments. Serves as repeat credit for 235. SPRING. [3] Ramsey.

241. Victorian England. (Formerly 245) Cultural values, liberal reform; urbanization; women and gender; imperialism. Serves as repeat credit for 245. SPRING. [3] Epstein.

243. The English Atlantic World, 1500–1688. (Formerly 268) English overseas expansion, including conquest of Ireland, exploration and conquest of the New World. Formation of imperial and American cultures and of racism, the slave trade, Indian relations, and migration from the British Isles. Serves as repeat credit for 268. SPRING. [3] Molineux.

244. Rise of the Iberian Atlantic Empires, 1492–1700. (Formerly 258) Pre-Columbian societies; the formation of the early Spanish state and imperial expansion in the Americas; the formation of multiethnic transatlantic societies. Serves as repeat credit for 258. FALL. [3] Robinson.

- 245. Decline of the Iberian Atlantic Empires, 1700–1820.** (Formerly 259) Reorganization of the Spanish and Portuguese empires, maturation of transatlantic societies; revolutions for independence. Serves as repeat credit for 259. SPRING. [3] Robinson.
- 246. Colonial Mexico.** (Formerly 261) The cultural history of major pre-Columbian groups; the conquest and settlement by the Spaniards; colonial society through independence in 1821. Serves as repeat credit for 261. [3] Wright-Rios. (Not currently offered)
- 247. Modern Mexico.** (Formerly 262) From independence in 1821 to the present. Political instability of the nineteenth century; the Porfirian dictatorship and the revolution of 1910; evolution and modernization of Mexico. Serves as repeat credit for 262. FALL. [3] Wright-Rios.
- 248. Central America.** (Formerly 265) Iberian and Amerindian background, colonial society; independence; growth of the plantation economy; the U.S. presence; political and social revolutions in the twentieth century. Serves as repeat credit for 265. [3] Robinson. (Not currently offered)
- 249. Brazilian Civilization.** (Formerly 264) From pre-Columbian times to the present. Clash and fusion of Portuguese, Amerindian, and African cultures; sugar and slavery; coffee and industrialization; race relations; dictatorship and democracy in the twentieth century. Serves as repeat credit for 264. SPRING. [3] Eakin.
- 250. Gender and Women in Colonial Latin America.** (Formerly 263) Gender constructions and their historical effects on Spanish, Amerindian, African, and mixed-race women from 1400 to 1800. Serves as repeat credit for 263. SPRING. [3] Landers.
- 251. Reform and Revolution in Latin America.** (Formerly 266) Comparative analysis of revolutions and reform movements in twentieth-century Latin America focusing on land tenure, social classes, political culture, economic structures, and foreign influences. Serves as repeat credit for 266. SPRING. [3] Wright-Rios.
- 260. North American Colonial History.** (Formerly 267) European colonization before 1763. Conflict, trade, and settlement in various regions. Evolution of colonial societies, Atlantic connections, and imperial rivalries. Serves as repeat credit for 267. [3] Molineux.
- 261. The Founding Generation.** (Formerly 173) American history from the 1760s to the 1820s. The Revolutionary War, the Constitution, formation of national government. Political conflict, national culture, commerce, diplomacy, and race and gender in an age of revolution. Primarily for juniors and seniors. No credit for students who have completed 272a or 173. [3] (Not currently offered)
- 262. The Old South.** (Formerly 276) The South's origins in European expansion; the rise of the plantation economy and society, and its identification with slavery; the differing experiences of whites and blacks, planters and nonplanters; the relationship of the region to the larger United States; the Confederate attempt at independence and the collapse of the slave regime. Serves as repeat credit for 276. FALL. [3] Carlton.
- 263. The New South.** (Formerly 277) The aftermath of war and emancipation and the era of Reconstruction; social change and dislocation in the late nineteenth century; the Populist Revolt; the origins of segregation and one-party politics. Twentieth-century efforts to modernize the region; the economic, political, and Civil Rights revolutions of the mid-twentieth century; the South in modern American society and politics. Serves as repeat credit for 277. SPRING. [3] Carlton.
- 264. Appalachia.** (Formerly 278) The region from first European intrusions to the present. Frontier-era white-indigenous contact, antebellum society and economy, relations with the slave South, the Civil War and postwar politics, increasing social strainings, industrialization and labor conflict, poverty and outmigration. Examination of mountain culture, tourism, and the construction of the "hillbilly" image. Serves as repeat credit for 278. Carlton. [3] (Not currently offered)

- 269. The Civil Rights Movement.** (Formerly 273) Following two decades of progress from *Brown v. Board of Education* in 1954 toward racial justice and equality in the United States. Leaders, organizations, and milestones. Serves as repeat credit for 273. [3] Dickerson.
- 270. The U.S. and the World.** (Formerly 282) From the winning of independence to the Great Depression. Relationships among foreign policy, ideology, domestic politics, and social and economic change. Serves as repeat credit for 282. [3] Schwartz. (Not currently offered)
- 271. The U.S. as a World Power.** (Formerly 283) From the origins of World War II, through the Cold War, to the present day. Relationships among foreign policy ideology, domestic politics, and social economic change. Serves as repeat credit for 283. FALL. [3] Schwartz.
- 280. Modern Medicine.** (Formerly 204) Scientific, social, and cultural factors influencing the rise of modern medicine. Europe and the U.S., 1750 to the present. Serves as repeat credit for 204. FALL. [3] Tuchman.
- 281. Women, Health, and Sexuality.** (Formerly 205) Women as patients and healers in the U.S. from 1750 to the present. Topics include women's diseases and treatments; medical constructions of gender, sexuality; childbirth, birth control, abortion; midwives, nurses, and doctors. Serves as repeat credit for 205. [3] Tuchman.
- 282. Chinese Medicine.** (Formerly 248) The historical divergences between medicine in China and the West. Readings in Chinese medical classics, including the Inner Cannon of the Yellow Emperor and early herbal manuals. Chinese medicine's encounter with Western medicine in the twentieth century; the creation of "Traditional Chinese Medicine" in the PRC and the emergence of Chinese medicine as "alter native medicine" in the U.S. Serves as repeat credit for 248. [3] (Not currently offered)
- 283. Medicine, Culture, and the Body.** (Formerly 206) (Also listed as Anthropology 260) Concepts of the human body from historical and cross-cultural perspectives. Exploration of experiences, representations, and medical theories of the body in birth, death, health, and illness in Western and non-Western societies. Comparison of methodologies of anthropology and history. Serves as repeat credit for 206. [3] Tuchman.
- 287c. Cities of Europe and the Middle East.** Cities of "East" and "West" in the modern period; distinguishing characteristics and shared patterns of urban modernity across different geographies. Conceptions of the European, Middle Eastern, and Islamic metropolis. SPRING. [3] Cohen.
- 300a–300b. Introduction to Historical Methods and Research.** FALL, SPRING. [4–4] Caferro, Clay.
- 301. The Art and Craft of Teaching History.** Readings on pedagogical theory and current research on college-level teaching and learning. Hands-on exercises in course design, preparing and grading tests and assignments, lecturing, leading discussion, cooperative and service learning, and use of technology to enhance teaching. Normally limited to graduate students in History. FALL. [4] Eakin.
- 302a–302b. Readings in American History.** 302a: to the Civil War; 302b: Civil War to the present. FALL, SPRING. [4–4] Molineux, Igo.
- 305. Studies in Comparative History.** SPRING. [4] Ramsey and Usner.
- 309. Studies in the Philosophy of History.** [4] (Not currently offered)
- 315. Studies in Early Modern European History.** [4] (Not currently offered)
- 317. The Long Reformation in Britain and America.** Perceptions of Protestantism in post-Reformation England, Scotland, Anglo-Ireland, the Gaidhealtachd, and the British American colonies. Anthropology of religion and ritual; recent secondary historical literature; spiritual

autobiographies, diaries, church court records, sermons. Optional instruction in early modern paleography. [3] (Not currently offered)

320. Studies in European History, 1815–1914. [4] (Not currently offered)

321. Topics in European History. SPRING. [4] Lake.

324. Studies in Recent European History. FALL. [4] Epstein.

330. Studies in German History. [4] (Not currently offered)

340. Urban History. Theoretical approaches to the dynamics of urban life in different historical times and places. Topics of special interest include rural-urban linkages; merchants and the state; plebeian culture and patrician society; the languages of class and gender; the myths and rituals of marginality; race and ethnicity; and global metropolitanism. [4] (Not currently offered)

344a. Studies in Modern England. [4] (Not currently offered)

344b. Seminar in Modern England. [4] (Not currently offered)

350. Topics in the History of the Human Sciences. [4] (Not currently offered)

350a–350b. History of Biography. A two-semester sequence course. Fall: art of biography; autobiography and biography; examination and analysis of major works in the nineteenth and twentieth century biography. Spring: entire semester devoted to the projection of a major biographical essay. [4] (Not currently offered)

358. Comparative Slavery in the Colonial Americas. Interdisciplinary and cross-cultural study of slavery and resistance in Spanish, British, French, Dutch, and Portuguese America. Does not cover antebellum slavery in the United States. FALL. [4] Landers.

359. Atlantic World History, Fifteenth to the Nineteenth Century. Interdisciplinary readings examining disparate colonizations and the creation of an Atlantic world system. Major themes include the consequences of Atlantic expansion on indigenous societies, the African slave trade, and the rise of Atlantic economics, the circulation of peoples, ideas, and material culture throughout the Atlantic and how imperial competition, political ideologies, and subaltern resistance shaped the Atlantic revolutions. Optional instruction in early modern paleography. [4] Landers.

360. Studies in Imperialism and the Colonial Other. The focus will be on representations of the other in European and American literary, cultural, and historical discourses; historical conditions that have produced various images of the colonial other, and recent criticisms of imperial colonial conditions. [4] (Not currently offered)

361. Topics in Latin American History. [4] (Not currently offered)

362. History of Gender and Women in Colonial Latin America. Interdisciplinary and cross-cultural study of the history of gender and its impact on Spanish, Indian, and African women in colonial Latin America. Major topics include gender and family roles, women's work and economy, legal and social statuses of distinct groups of women and related issues of social control, and the religious and public lives of women. [4] Landers. (Not currently offered)

365. Seminar in Latin American History. SPRING. [4] Wright-Rios.

371. Studies in Early American History to 1783. [4] (Not currently offered)

372. Studies in the Middle Period of American History , 1783–1861. [4] (Not currently offered)

- 373. Studies in U.S. History, 1861–1900.** [4] (Not currently offered)
- 374. Studies in Recent American History.** FALL. [4] Gerstle.
- 375. Seminar in Recent American History.** [4] (Not currently offered)
- 378. Studies in the History of the South.** [4] (Not currently offered)
- 379. Non-candidate Research.** Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]
- 380. Studies in American Diplomatic History.** [4] (Not currently offered)
- 381. Topics in American History.** SPRING. [4] Blackett.
- 384a. Studies in American Social History.** [4] (Not currently offered)
- 384b. Seminar in American Social History.** [4] (Not currently offered)
- 386. Studies of Women in the United States.** [4] (Not currently offered)
- 390a–390b. Independent Study.** [Variable credit: 1–3 each semester]
- 398. Dissertation Seminar.** FALL, SPRING. [3] Crawford/Lunbeck, Gerstle.
- 399. Ph.D. Dissertation Research.** FALL, SPRING. [3]
- 3995. Half-time Ph.D. Dissertation Research.** For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

History of Art

CHAIR Christopher M. S. Johns

VICE CHAIR Vivien Green Fryd

PROFESSORS EMERITI Robert A. Baldwin, Thomas B. Brumbaugh, F. Hamilton Hazlehurst, Milan Mihal, Ljubica D. Popovich

PROFESSORS Leonard Folgarait, Vivien Green Fryd, Christopher M. S. Johns

ASSOCIATE PROFESSORS Tracy Miller, Robert L. Mode, Betsey Robinson, Barbara Tsakirgis

ADJUNCT ASSOCIATE PROFESSOR Susan Edwards

MELLON ASSISTANT PROFESSOR Morna O'Neill

ASSISTANT PROFESSORS James J. Bloom, Jinah Kim, Mireille Lee, Elizabeth J. Moodey

SENIOR LECTURER Sheri Shaneyfelt

✚ THE faculty in art history gives special attention to breadth of coverage and period continuity. Both Western and non-Western traditions are included, with particular emphasis on medieval to baroque art and early modern to contemporary art in Europe and America. A research collection, the Contini-Volterra Archive, is housed in the library and contains thousands of photographs presenting a thorough documentation of painting in Italy and elsewhere from the thirteenth through the eighteenth centuries.

The department stresses the interrelationship of history, anthropology, classics, philosophy, religion, and many of the social sciences. Members of

the faculty represent different approaches to the field, encouraging diversity in the art history program.

The department is not currently accepting applications for graduate study, but will once a new program is in place. We are in the process of reconfiguring the graduate program to better meet the needs of the growing professionalism in our discipline.

Human Genetics

DIRECTOR Scott M. Williams

DIRECTOR OF GRADUATE STUDIES Scott M. Williams

PROFESSORS Judy Aschner, Michael Aschner, Thomas Aune, H. Scott Baldwin, Randy D. Blakely, Kendal Broadie, Ellen Wright Clayton, James Crowe, Ellen Fanning, Sergio Fazio, Al George, Jonathan L. Haines, Pat Levitt, MacRae Linton, David McCauley, James Patton, John A. Phillips III, Dan Roden, Marshall Summar, Laurence J. Zwiebel

ASSOCIATE PROFESSORS Ela Knapik, Lilianna Solnica-Krezel, James S. Sutcliffe, Scott M. Williams

ASSISTANT PROFESSORS Jeff Canter, Dana Crawford, Katherine Friedman, Rizwan Hamid, Jennifer Kearney, Tsutomui Kume, Chun Li, Douglas Mortlock, Deborah Murdock, Marylyn D. Ritchie, Michelle Southard-Smith, Jeffrey Smith

DEGREE OFFERED: *Doctor of Philosophy*

✳️ THE overall goal of the Human Genetics Ph.D. degree program is to provide students with a solid foundation for a career in genetics research and teaching. Training is available in human genetic analysis and in genetic analysis of model systems that contribute to our understanding of human disease. The training combines a prescribed set of basic courses intended to ground students in the fundamentals of genetic analyses, the basics of human genetics, a set of elective courses designed to meet individual needs, and a rigorous research experience that will contribute to the field of genetics. Students completing the requirements of the Ph.D. program in Human Genetics will have demonstrated mastery of knowledge in genetics and contributed substantial and original scientific knowledge to the field.

Ph.D. students in the Human Genetics program are required to complete a minimum of 29 credit hours of formal course work, consisting of 23 hours of required course work and 6 hours of electives. One of the required courses will be a statistics course to be chosen from several currently available on campus and approved by the program faculty. Students will take a minimum of 6 hours of didactic classes per semester during their first two years of study. It is expected that during the second year at least one semester will exceed this minimum in order to complete the required courses prior to year three of study. The electives come from an approved list of advanced genetics courses and the choice of these courses will be based on the individual student's research interests.

Students may take one of two paths in their training. One is more focused on population and/or statistical genetics, and these students will opt for courses that emphasize statistical and population approaches. Students more interested in functional studies will take courses that emphasize molecular genetics/genomics.

For additional information, see chgr.mc.vanderbilt.edu/page/education.

320. Human Genetics. Research/techniques in human genetics. By arrangement. [Variable credit]

340. Human Genetics I. Designed to cover background and latest advances in human genetics. Topics will include an overview of mutational mechanisms, cytogenetics (detection and description of chromosomal abnormalities), biochemical genetics (gene defects in biochemical pathways), molecular genetics (gene structure, function, and expression). Topics will be discussed with reference to specific human genetic diseases. FALL. [3] Summar, Mortlock.

341. Human Genetics II. This course will cover the statistical, population, and analytical aspects of modern human genetics research. Topics to be covered include human population genetics, quantitative genetics, linkage and association analyses, computational genetics, and evolutionary genetics. Clinical examples, subject ascertainment, and study design will also be emphasized. Students must have a strong understanding of Mendelian genetics and basic biostatistics. Prerequisite: permission of instructor. SPRING. [3] Haines and Staff.

349. Genetics of Model Organisms. (Also listed as Cell and Developmental Biology 349, Molecular Physiology and Biophysics 349) Basic genetic principles across a broad range of organisms (yeast, *C. elegans*, *Drosophila melanogaster*, plants, mouse, zebrafish) that are used in genetic analyses to investigate molecular pathways of interest for human disease will be presented. This course will provide students with in-depth terminology and understanding of the advantages, applications, and approaches specific to each organism. Genomic and bioinformatics tools that facilitate genetic analysis in each species will be emphasized. Specific examples of how each model organism has successfully contributed to elucidation of a human disease gene, pathway, or genetic principle will be presented. Course combines faculty lectures with student presentation and discussion of original articles to emphasize the uniqueness of each model system. Prerequisite: one statistics course at the upper undergraduate level or higher and Fundamentals of Genetic Analysis (MPB 385), or permission of instructor. Offered every other year. SPRING. [3] Southard-Smith and Staff.

350. Directed Study in Human Genetics. Introduction to current research through readings of the genetics literature. Given on an individual basis by arrangement. May be taken more than once, but not for more than 4 hours credit with a single adviser, nor for more than 5 hours total. Prerequisite: consent of instructor and DGS. FALL, SPRING, SUMMER. [Variable credit: 1–4] Staff.

370. Tutorials in Human Genetics. A weekly seminar critically evaluating current and past scientific literature from many areas of genetic research. The focus will be on study methods and analysis. FALL. [1] Canter, Kearney.

371. Tutorial in Statistical and Population Genetics. The class meets once weekly. Graduate students critically evaluate research publications in areas statistical methods in human genetic analysis and in the area of human population genetics. Also, there are faculty presentations on ancillary science skills, such as oral and poster presentations, and grant and proposal writing. SPRING. [1] Crawford, Li.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

385. Fundamentals of Genetic Analysis. This course is designed to accomplish three goals: (1) introduce students to critical topics of genetic research, (2) introduce students to important areas of genetic research not covered in first-year course work, and (3) promote an understanding of classical genetic analysis by learning genetics using the original literature. The approach will be to use classic literature that defined significant problems in genetic research. Specific topics will include: genetic analysis (segregation, independent assortment and locus mapping), human pedigree analysis and disease gene mapping, and population/quantitative genetics. FALL. [4] Williams and Staff.

390. Human Genetic Epidemiology. This course will cover in detail the study design and methods of modern genetic epidemiology. This will include concepts of familial aggregation, linkage analyses, population genetics as it is applied to studies of human traits, and association studies, both candidate genes and genome-wide association. The concept of linkage disequilibrium and its use in disease-gene studies will be extensively discussed. The underlying principles of each approach will be developed and current methods and software programs used to perform these will be discussed. Emphasis will be placed on the advantages and disadvantages of each approach and how to best design a genetic epidemiology study. [3] Williams, Crawford.

399. Ph.D. Dissertation Research. [Variable credit] Staff.

Interdisciplinary Materials Science

DIRECTOR Timothy P. Hanusa

DIRECTOR OF GRADUATE STUDIES James E. Wittig

PROFESSORS EMERITI Robert J. Bayuzick, William F. Flanagan, Tomlinson Fort,

George T. Hahn, Donald L. Kinser, Barry D. Lichter, James J. Wert

PROFESSORS Peter Cummings, Jimmy L. Davidson, Leonard C. Feldman, Daniel M.

Fleetwood, Kenneth F. Galloway, Todd D. Giorgio, Richard F. Haglund, Timothy P.

Hanusa, Weng Poo Kang, Paul Laibinis, Charles M. Lukehart, Lloyd Massengill,

Socrates T. Pantelides, Sandra Rosenthal, Ronald D. Schrimpf, Alvin M. Strauss,

Norman Tolk, Taylor G. Wang, Robert A. Weller

RESEARCH PROFESSOR EMERITUS Robert A. Weeks

ADJOINT PROFESSOR James Bentley

ASSOCIATE PROFESSORS David E. Cliffler, Frederick R. Haselton, G. Kane Jennings,

Piotr Kaszynski, Clare McCabe, Bridget R. Rogers, Greg Walker, James E. Wittig,

David W. Wright

RESEARCH ASSOCIATE PROFESSORS A. V. Anilkumar, Anthony Hmelo

ASSISTANT PROFESSORS James Dickerson, Eva Harth, Deyu Li, Florence Sanchez,

Kalman Varga, Sharon Weiss, L. Roy Xu

ADJUNCT ASSISTANT PROFESSOR Robert H. Magruder III

DEGREES OFFERED: *Master of Science, Doctor of Philosophy*

✦ **FIELDS of study:** electronic materials, magnetic materials, superconducting materials, nanostructured materials, molecular engineering and science, surface and interface science, thin films, surface modification, radiation effects in solid state devices, organic-based devices, materials synthesis, solidification, materials characterization, materials physics.

In general, materials advancements improve the standard and the quality of living. They are indeed the underpinning of the development of new technologies. In today's sophisticated and complicated climate, continued advancements in materials demand intimacy among a variety of disciplines. In recognition of this at Vanderbilt University, faculty from Departments of Chemistry, Physics, Materials Engineering, Chemical Engineering, Electrical Engineering, Mechanical Engineering, and Civil Engineering have come together in the Interdisciplinary Program in Materials Science. In this arena, there is extensive collaboration in both the teaching of and research in materials science.

The richness of the research activities within the program is a reflection of the richness of the education offered within the program. Many research areas focus on electronic/optical thin films, nanostructures, and the interaction of intense optical radiation with matter. Electronic and optical thin films are at the forefront of materials science and span the range from semiconductor applications to biomedical materials. Ion bombardment processes and their role in the creation of new materials is a central area of research within the program. Some of the current experimental activity embraces the creation of defect complexes in silicon and the dynamical interaction of these defects with the lattice phonons. Other ion bombardment programs involve the creation of unique microstructures by ion implantation and the understanding of such processes. Additional initiatives within the program concentrate on research regarding molecular electronics, seeking new materials systems and fundamental processes to form electronically active elements on the molecular size level. There is also a wide range of materials synthesis activities for the formation of innovative materials such as molecular precursors for thin-film chemical-vapor-deposition, molecules for optoelectronic and magnetic applications, novel liquid crystals, semiconducting nanocrystals, nanocomposites, sol-gel ceramics and photovoltaics. Still another predominant set of investigations studies the effect of radiation on the performance of advanced integrated circuit systems in the space environment. Some other examples of research projects include diamond deposition processes with emphasis on structure and properties, novel production processes for high temperature superconductors, and solidification processes for the development of high performance structural materials.

The M.S. degree in materials science requires a minimum of 24 semester hours (beyond the baccalaureate) of formal course work plus a thesis. Nine semester hours are a selection of three of the four Materials Science core program courses. The core courses are Thermodynamics, Materials Chemistry, Atomic Arrangements in Solids, and Solid State Physics of Condensed Matter. Six additional hours are taken from the approved list of Interdisciplinary Materials Science program courses. A minor consisting of 6 semester hours is chosen in a separate but related field. The remaining 3 hours are an elective selected from either Interdisciplinary Materials Science program offerings or a related field.

The Ph.D. degree in materials science requires a total of 72 semester hours (beyond the baccalaureate) plus a dissertation. Within the requirement are a

minimum of 24 semester hours of course work that include 12 hours from the materials science core curriculum and 12 hours from the approved list of Interdisciplinary Materials Science program courses. The intent of these courses is to complement the student's technical interests. The remaining semester hours may be in research dissertation hours or in additional course electives.

The Master of Engineering, an advanced professional degree for engineers, is offered by the School of Engineering.

CE 295. Mechanics of Composite Materials. Review of constituent materials (reinforcements, matrices, and interfaces) and fabrication processes. Prediction of properties of unidirectional and short fiber materials (micromechanics). Anisotropic elasticity (derivation of Hooke's law for anisotropic materials, macromechanics of laminated composites). Analysis of laminated composites based on Classical Lamination Theory. Behavior of composite beams and plates. Special topics (creep, fracture, fatigue, impact, and environmental effects). Prerequisite: CE 182 and MSE 150. SPRING. [3]

CHE 284. Semiconductor Materials Processing. This course introduces the unit operations of semiconductor materials processing applied to silicon device manufacturing. We will cover some basic semiconductor physics and device theory, the production of silicon substrates, dopant diffusion, ion implantation, thermal oxidation and deposition processes, plasma deposition processes, photolithography, wet chemical and plasma etching, and analytical techniques. FALL [3] Rogers.

CHE 290. Molecular Aspects of Chemical Engineering (Special Topics). An introduction to the concepts of materials design from a chemical perspective. Basic principles of covalent and ionic bonding, intermolecular interactions and their effects on the properties of liquids and solids. Manipulating the macroscopic properties of chemical systems by molecularly engineering their "active" components. Molecular design. Applications in biomaterials, membrane technology, colloids, and surface science. Prerequisite: consent of instructor. SPRING [3] Jennings.

CHE 320. Surfaces and Adsorption. Surface energy, capillarity, contact angles and wetting, surface films, insoluble monolayers, solid surfaces, membranes, surface area determination, adsorption, adhesion, interface thermodynamics, friction and lubrication, interfaces in composites, relationships of surface to bulk properties of materials. FALL. [3] Fort.

CHE 325. Polymer Sciences and Engineering. Macromolecular systems with emphasis on the interrelationship of chemical, physical, and engineering properties and the further relation of these properties to synthesis and application. A basic understanding of organic and of physical chemistry is assumed. [3] (Not currently offered)

CHEM 235. Surface and Polymer Chemistry. Spectroscopic methods for studying surfaces, with emphasis on polymer systems. Prerequisite: CHEM 230. [3] (Not currently offered)

CHEM 312. Electrochemistry: Theory and Analysis. FALL. [3] Cliffel. (Offered in alternate years)

CHEM 330a. Quantum Chemistry I. Limits of classical mechanics at the atomic and molecular level; the postulates of quantum mechanics applied to problems in one, two, and three dimensions; perturbation and various methods. Prerequisite: CHEM 232 and MATH 223ab or MATH 222-229. SPRING. [3] Polavarapu.

CHEM 330b. Quantum Chemistry II. Advanced topics in the application of quantum mechanics to chemical bonding and spectroscopy. Prerequisite: CHEM 330a. [3] (Not currently offered)

CHEM 331. Statistical Thermodynamics. Statistical mechanics and chemical equilibrium; distribution laws, partition functions, and thermodynamic properties of atoms and molecules; applications to gases, liquids, and solids. Prerequisite: CHEM 232. FALL. [3] Schaad.

CHEM 335. Thermodynamics and Kinetics of Organic and Inorganic Materials. Equilibrium in chemical and physical processes of ideal and real systems. Reaction rates for elementary mechanisms. SPRING [3]. Schaad.

CHEM 350. Materials Chemistry. A survey of modern materials chemistry with an emphasis on the chemistry related to the preparation, processing, identification, analysis, and applications of materials. FALL [3]. Lukehart.

ECE 283. Principles and Models of Semiconductor Devices. Physical principles of operation of the p-n junction, MOS field-effect transistor, and bipolar transistor. Fundamentals of charge transport, charge storage, and generation-recombination; application to the operation of MOSFET and BJT. Device modeling with emphasis on features and constraints of integrated circuit technologies. Prerequisite: ECE 235 or consent of instructor. SPRING. [3] Kang.

ECE 284. Integrated Circuit Fabrication and Technology. Introduction to monolithic integrated circuit technology. Understanding of basic semiconductor properties and processes that result in modern integrated circuit. Bipolar and MOSFET processes and structures. Elements of fabrication, design, layout, and applications as regards semiconductor microelectronic technologies. Prerequisite: ECE 235 or consent of instructor. SPRING. [3] Davidson.

ECE 301. Introduction to Solid State Materials. The properties of charged particles under the influence of an electric field, quantum mechanics, particle statistics, fundamental particle transport, and band theory of solids will be studied. FALL. [3] Weller.

ECE 302. Electric and Magnetic Properties of Solids. Fundamentals of the electrical and magnetic properties of solids. Dielectric and magnetic properties are discussed. Prerequisite: ECE 301 or equivalent. SPRING. [3] Weller.

ECE 305. Topics in Applied Magnetics. Selected topics in magnetism, magnetic properties of crystalline and noncrystalline materials; ferrite materials for electronics and microwave applications, resonance phenomena. Prerequisite: ECE 302 or consent of instructor. [3] (Offered on demand)

ECE 306. Solid-State Effects and Devices I. The semiconductor equations are examined and utilized to explain basic principles of operation of various state-of-the-art semiconductor devices including bipolar and MOSFET devices. SPRING. [3] Schrimpf.

ECE 307. Solid-State Effects and Devices II. The structure of solids, phonons, band theory, scattering phenomena, and theory of insulators. [3] (Offered on demand)

IMS 320. Nanoscale Science and Engineering. A multidisciplinary approach to the study of the fundamentals uniquely pertaining to the processing, structure, and performance of materials on the dimensional scale of tens to hundreds of atoms. The science and engineering of nanomaterials. Methods for synthesis and fabrication, techniques for characterization, and the attainment of special properties at the nanoscale. An examination of present and future applications in biotechnology, medicine, and engineering. FALL. [3] Jennings and Staff.

ME 365. Special Topics in Heat Transfer. Topics such as boiling, condensation, ablation and heat transfer in MHD flows, rarefied gases, and two-phase flows are studied. Prerequisite: ME 363, ME 364. [3]

MSE 250. Materials Science II. Combines a physical chemistry approach with development of concepts of microstructures applied to ceramics, glasses, metals, semiconductors,

polymers, and composites. Includes a brief survey of relevant areas of thermodynamics and kinetics; phase equilibria; characterization of phases; diffusion, solidification, and resulting structure and properties; solid-state transformations; synthesis and modern processing techniques. Prerequisite: MSE 150. SPRING. [3] Bayuzick.

MSE 310. Atomic Arrangements in Solids. A basic understanding of the atomic arrangements observed in metals, ceramics, semiconductors, glasses, and polymers. Lattice geometry and crystal symmetry are discussed in detail and these concepts are used to describe important crystal structures. Nanocrystalline materials are also covered. An introduction to scattering theory and diffraction phenomena provides insight into the analytical methods used by materials scientists for structural characterization. FALL. [3] Wittig.

MSE 343. Introduction to Electron Microscopy. Principles and applications of transmission electron microscopy in the study of materials. Electron scattering, image contrast theory, operation of electron microscope, and specimen preparation. Use of the electron microscope in experimental investigations. Two lectures and one laboratory period. Prerequisite: consent of instructor. FALL [3] Wittig.

MSE 369. Master's Thesis Research. FALL, SPRING. [0] Staff.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

MSE 391–392. Special Topics. Based on faculty research projects and highly specialized areas of concentration. FALL, SPRING. [Variable credit: 1–3 each semester] Staff. 392, Weller.

MSE 397–398. Seminar. A required noncredit course for all graduate students in the program. Topics of special interest consolidating the teachings of previous courses by considering topics that do not fit simply into a single course category. FALL, SPRING. [0–0] Staff.

MSE 399. Ph.D. Dissertation Research. FALL, SPRING. [0–12] Staff.

PHYS 223. Thermal and Statistical Physics. Temperature, work, heat, and the first law of thermodynamics. Entropy and the second law of thermodynamics. Kinetic theory of gases with applications to ideal gases and electromagnetic radiation. FALL. [3] Webster.

PHYS 225a–225b. Introduction to Quantum Physics and Applications. A survey of modern physics using elementary quantum mechanics. 225a: Atomic and molecular structure and spectroscopy. Solid state physics. 225b: Nuclear structure decay and reactions. Properties and classifications of elementary particles. Recommended: Math 198. FALL. [4–4] Albridge and Csorna.

PHYS 251a–251b. Introduction to Quantum Mechanics. Wave-particle duality, indeterminacy, superposition, the Schrödinger equation, angular momentum and scattering, perturbation theory. Prerequisite: PHYS 225a and PHYS 227a. Recommended: MATH 2429. FALL. [3–3] Green and Talk.

PHYS 254. Physics of Condensed Matter. Crystal structure and diffraction; phonons and lattice vibrations; free-electron theory of metals; elementary band theory of solids; semiconductors; optical properties of insulators; and applications to solid-state devices, magnetism, and superconductivity. Prerequisite: PHYS 223, PHYS 225a, and PHYS 227b. SPRING. [3] Feldman.

PHYS 330a–330b. Quantum Mechanics. Wave and matrix forms of the theory, transformation theory, theory of angular momentum, systems of indistinguishable particles, approximate methods of solution, energy levels and scattering processes, and introduction to relativistic quantum mechanics. Prerequisite: PHYS 251, MATH 292. [3–3] Ernst and Perakis.

PHYS 341. Statistical Mechanics. Phase space, entropy and reversibility; ensemble theory; Fermi and Bose Statistics; systems of interacting particles; equation of state, critical phenomena, and phase transitions; pairing and superfluidity. SPRING. [3] Gittes.

PHYS 354a–354b. Condensed Matter Theory. Free-electron theory of metals; elementary band theory of solids; quantum theory of the harmonic crystal; elementary excitations; optical properties of materials; electronic basis of magnetic interactions; density-functional theory; relativistic band structure; electronic localization and amorphous solids; two-dimensional phase transitions and superlattices. Prerequisite: PHYS 330 or consent of instructor. 354a: SPRING. [3–3] Pantelides.

PHYS 357a–357b. Atomic and Molecular Physics. Quantum mechanical treatment of atomic and molecular structure and dynamics, including binding, transitions, radiative transfer processes, and dynamics of elastic and inelastic scattering of electron-atom and atom-atom systems. Prerequisite: PHYS 330a–330b. SPRING. [3–3]

PHYS 359a. Surface Structure and Dynamics. Geometrical and electronic structure of surfaces, including surface reconstruction, density of states, and effects of adsorbates, impurities, and electronic defects. Prerequisite: PHYS 330a–330b. [3] Feldman.

Interdisciplinary Social and Political Thought

✂ STUDENTS with an interest in expanding their knowledge of social and political thought beyond traditional disciplinary boundaries are invited to propose an individualized interdisciplinary Master of Arts degree in social and political thought. The program is coordinated by Professor Brooke Ackerly (Political Science). Students develop, in consultation with the coordinator, a set of courses, including Interdisciplinary Social and Political Thought 320a–320b, drawing on courses from any of the following graduate programs, to complete the 24 semester hours required for a master's degree: English, History, Philosophy, Political Science, Religion, and Sociology. The thesis topic must cross disciplinary boundaries.

320a–320b. Foundations of Social and Political Thought. Interdisciplinary study of a theme in social and political thought as reflected in the disciplines of communication studies, comparative literature, English, history, philosophy, political science, religion, and sociology. The first semester focuses on how the theme, currently “equality,” is treated conceptually within these disciplines; the second, on how the study of the theme is treated within these disciplines. [3–3] (Offered 2010/2011)

Japanese

JAPANESE LANGUAGE PROGRAM COORDINATOR Keiko Nakajima
 SENIOR LECTURER Keiko Nakajima
 LECTURER Ayaka Sogabe

✂ COURSES in Japanese are available for minor credit in master's degree programs only. Students should consult their advisers about the acceptability of the courses as related work.

200a. Introductory Modern Japanese. Simple conversation, writing system, and reading. Designed exclusively for students with little or no previous exposure to Japanese. No credit for Japanese 200a when student has completed 201. SPRING. [3] Sogabe.

200b. Introductory Modern Japanese. Continuation of 200a. No credit for Japanese 200b when student has completed 201. Prerequisite: 200a or instructor's consent. FALL. [3] Sogabe.

201. Beginning Modern Japanese I. Introduction to Modern Japanese language including the acquisition of oral-aural skills, basic grammar, and introduction to reading and writing Japanese syllabaries and Chinese characters. FALL. [5] Nakajima, Sogabe.

202. Beginning Modern Japanese II. Prerequisite: 200b or 201. SPRING. [5] Nakajima, Sogabe.

211. Second-Year Modern Japanese I. Development of conversational skills and pragmatic competence. Syntax, writing, and reading. Prerequisite: 202. FALL. [5] Nakajima, Sogabe.

212. Second-Year Modern Japanese II. Prerequisite: 211. SPRING. [5] Nakajima, Sogabe.

241. Third-Year Japanese I. Reading and writing in contemporary Japanese texts. Conversation, discussion, and development of pragmatic competence. Prerequisite: 212. FALL. [3] Nakajima.

242. Third-Year Japanese II. Prerequisite: 241. SPRING. [3] Nakajima.

251. Fourth-Year Japanese I. Reading, writing, and discussion in authentic Japanese cultural, literary, and historical texts. Prerequisite: 242. FALL. [3] Sogabe.

252. Fourth-Year Japanese II. Prerequisite: 251. SPRING. [3] Sogabe.

289a–289b. Independent Study. A reading course which may be repeated with variable content according to the needs of the individual student. Primarily designed to cover materials not otherwise available in the regular curriculum. FALL, SPRING. [Variable credit: 1–3, not to exceed a total of 12 over a four-semester period]

Jewish Studies

See Religion

Latin American Studies

DIRECTOR Edward F. Fischer

ASSOCIATE DIRECTORS Susan Berk-Seligson, W. Frank Robinson

ASSOCIATE PROFESSOR Susan Berk-Seligson

LATIN AMERICAN BIBLIOGRAPHER Paula Covington

Affiliated Faculty

PROFESSORS Arthur A. Demarest (Anthropology), Tom D. Dillehay (Anthropology), Katharine Donato (Sociology), Marshall Eakin (History), Edward F. Fischer (Anthropology), Earl E. Fitz (Spanish and Portuguese), Leonard Folgarait (History of Art), James E. Foster (Economics), Edward H. Friedman (Spanish and Portuguese), Lesley Gill (Anthropology), Thomas A. Gregor (Anthropology), Cathy L. Jrade (Spanish and Portuguese), William Luis (Spanish and Portuguese), Andrea Maneschi (Economics), René Prieto (Spanish and Portuguese), Philip D. Rasico (Spanish and Portuguese), Mitchell A. Seligson (Political Science), David Wasserstein (History)

ASSOCIATE PROFESSORS M. Fräncille Bergquist (Spanish and Portuguese), Victoria Burrus (Spanish and Portuguese), Beth A. Conklin (Anthropology), William R. Fowler Jr. (Anthropology), Jonathan Hiskey (Political Science), John Janusek (Anthropology), Carlos Jáuregui (Spanish and Portuguese), Jane G. Landers (History), James J. Lang (Sociology), Emanuelle Oliveira (Spanish and Portuguese), Norbert O. Ross (Anthropology), Benigno Trigo (Spanish and Portuguese), Andrés Zamora (Spanish and Portuguese)

ASSISTANT PROFESSORS Jason Borge (Spanish and Portuguese), Pierre Colas (Anthropology), Christina Karageorgou (Spanish and Portuguese), W. Frank Robinson (History), Sergio Romero (Anthropology), Miriam Shakow (Anthropology), Helena Simonett (Latin American Studies), Tiffany A. Tung (Anthropology), Steven Wernke (Anthropology), Edward Wright-Rios (History), Elizabeth J. Zechmeister (Political Science)

SENIOR LECTURERS Frances Alpren (Spanish and Portuguese), Ana Regina Andrade (Economics), Tatiana Botero (Spanish and Portuguese), Lorraine Catanzaro (Spanish and Portuguese), Paula Covington (Latin American Studies), Sarah Delassus (Spanish and Portuguese), Chalene Helmuth (Spanish and Portuguese), Paul Miller (Spanish and Portuguese), Elena Olazagasti-Segovia (Spanish and Portuguese), Raquel Rincón (Spanish and Portuguese), Waldir Sepúlveda (Spanish and Portuguese), Cynthia Wasick (Spanish and Portuguese)

DEGREE OFFERED:

LATIN AMERICAN STUDIES. *Master of Arts*

✦ THE Center for Latin American Studies offers an interdisciplinary program of graduate instruction in Latin American Studies in cooperation with the departments of Anthropology, Economics, History, History of Art, Political Science, Sociology, and Spanish and Portuguese. Affiliated faculty from other schools, including Peabody College (education and human development), Vanderbilt Law School, Owen School (management), School of Medicine, and School of Nursing also participate in the center. Students work toward an M.A. in Latin American Studies, a master's or doctoral degree in one of the related programs with a minor in Latin American Studies, or a certificate in Latin American Studies.

Candidates for the M.A. in Latin American Studies choose a thesis (24 hours and thesis) or non-thesis (33 hours) option. Each option includes Latin American Studies 290. Candidates may spend part of their third or fourth semester doing research in Latin America, subject to approval by the center, the dean of the College of Arts and Science, and the Graduate School. Master's degree candidates are expected to demonstrate language ability in Spanish, Portuguese, or an indigenous Latin American language; this means advanced ability in one of the three languages and intermediate ability in another.

Students combining a master's degree from a related discipline with a minor in Latin American Studies select area courses as their minor and knowledge of either Spanish, Portuguese, or an indigenous Latin American language. Doctoral candidates with a minor in Latin American Studies must have a reading and speaking competence in either Spanish, Portuguese, or an indigenous Latin American language, and a technical reading knowledge of another. The doctoral minor consists of not less than 15 hours, selected from area courses in two disciplines.

A certificate in Latin American Studies is awarded with either the M.A. or Ph.D. degree upon completion of at least 15 hours of course work across two or more disciplines and demonstration of language competence.

A joint Master of Arts and Master of Business Administration degree program is available. Students apply both to Owen Graduate School of Management and the Center for Latin American Studies. Successful applicants must be accepted both by the Owen School and the Graduate School. The first year of study is devoted to the M.B.A. program (30 hours), the second to course work in Latin American Studies (24 hours), and the final year is divided between M.B.A. studies and the writing of the master's thesis for the M.A. degree. Interested students should contact the Center for Latin American Studies.

201. Introduction to Latin America. A multidisciplinary survey of Latin America from pre-Columbian times to the present emphasizing culture, economic and political patterns, social issues, literature, and the arts in a historical perspective. SPRING. [3] Robinson (History).

234. Twentieth-Century Mexican Literature, Film, and Art. The historical, social, and political dynamic as expressed in various art forms. The relation between social reality and aesthetic form. [3] Folgarait (History of Art).

235. Gender, Ethnicity, and Language in the Americas. The interconnections between gender, ethnicity, and language, particularly in those regions of the Americas where Spanish is spoken. The ethnography of speaking, highlighting verbal art among indigenous peoples of Latin America and among U.S. Latinos. Phenomena resulting from bilingualism and language contact. Language rights (e.g., access to justice, right to use a language other than an official language in institutional settings). SPRING. [3] Berk-Seligson (Latin American Studies).

260. Latin America, Latinos, and the United States. Immigration of Latin American and Caribbean peoples to the United States and their experiences in this country. Required service work and a research project in the Nashville Latino community. [3] Staff.

290. Interdisciplinary Research Methods. Principal research methods and sources necessary for the study of Latin America in the social sciences and humanities. FALL. [3] Covington (Latin American bibliographer), Robinson (History).

293. Research Projects and Design. This course will cover such topics as research design and proposal writing, gaining access to data, the ethics of field research, sampling techniques, interviewing, questionnaire design and question writing, the use of audio equipment in the field, and data analysis. Berk-Seligson (Latin American Studies).

294a. Special Topics in Latin American Studies. Selected special topics suitable for interdisciplinary examination from the perspective of the social sciences and humanities, as announced in the *Schedule of Courses*. [3] Staff.

330. Culture and Music in the Mexican Borderlands. Ethnographies and interpretations of social-cultural life in the U.S.-Mexico borderlands. FALL. [3] Simonett (Latin American Studies).

369. Master's Thesis Research. [0]

370. Fieldschool in Intercultural Education. Provides training in field research directed to human, social, and community development issues. Student research sponsored and supervised by an interdisciplinary team from Vanderbilt University and the Latin American faculty of social sciences (FLACSO). Fluency in Spanish required. SUMMER. [3] Staff.

390a–390b. Independent Study. A program of independent readings and research in a minimum of two disciplines, to be selected in consultation with the center's graduate adviser. FALL, SPRING. [3–3]

See departmental listings for courses offered 2008/2009. The following are specialized courses in the participating programs.

ANTHROPOLOGY: 210, Peoples and Cultures of Latin America; 212, Ancient Mesoamerican Civilizations; 213, Archaeology of the Ancient Maya Civilization; 215, The Collapse of Civilizations; 216, Ancient Cities; 219, Comparative Writing Systems; 220, Peoples and Cultures of Mexico; 221, Maya Languages and Literature; 223, Introduction to Classical Nahuatl; 226, Myth, Ritual, Belief: The Anthropology of Religion; 232, The Anthropology of Globalization; 240, Medical Anthropology; 246, Peoples and Cultures of the Andes; 247, The Aztecs; 248, Ancient Empires and Civilizations of South America; 249, Indians of South America; 250, Anthropology of Healing; 254, The Inca Empire; 258, Mayan Languages and Linguistics; 259, Maya Culture and Ethnography; 269, Introduction to a Maya Language; 275, Sociocultural Field Methods; 276, Modern Yucatec Maya; 281, Classic Maya Religion and Politics; 288a–288b, Independent Research; 303, Seminar in Maya Ethnography; 325, The Collapse of Civilizations: General Theories and the Maya Collapse; 328, Violence and Its Embodiments in the Past and Present; 349, The Historical Archaeology of Latin America; 350, Seminar in Mesoamerican Archaeology; 355, Seminar in Mesoamerican Art; 360, Seminar in South American Archaeology and Ethnohistory.

ECONOMICS: 222, Latin American Economic Development; 288, Development Economics; 349a–349b, Reading Course; 353, Project Evaluation; 357, International Trade and Economic Development; 358a–358b, Policy Issues in Developing Economies.

HISTORY: 244, Rise of the Iberian Atlantic Empires, 1492–1700; 245, Decline of the Iberian Atlantic Empires, 1700–1820; 246, Colonial Mexico; 247, Modern Mexico; 248, Central America; 249, Brazilian Civilization; 250, Gender and Women in Colonial Latin America; 251, Reform and Revolution in Latin America; 257, Caribbean History, 1492–1983; 358, Comparative Slavery in the Colonial Americas; 359, Atlantic World History, Fifteenth to the Nineteenth Century; 361, Topics in Latin American History; 362, Gender and Women in Colonial Latin America; 365, Seminar in Latin American History; 390a–390b, Independent Study.

HISTORY OF ART: 234, Twentieth-Century Mexican Literature, Film, and Art; 245, Art of Pre-Columbian America; 256, Art of the Maya; 257, Mesoamerican Art; 289, Independent Research; 294, Selected Topics.

MUSIC: 250, Latin American and Caribbean Music.

POLITICAL SCIENCE: 213, Democracy and Political Development; 215, Change in Developing Countries; 217, Latin American Politics; 218, Social Reform and Revolution; 219, Politics of Mexico; 225, International Political Economy; 228, International Politics of Latin America; 315, Research in Latin American Politics; 316, Politics of Change in the Third World; 317, Political Economy of Development; 319, Research in Comparative Analysis; 323, Current Theory and Research in World Politics; 325, International Political Economy; 390a–390b, Independent Study.

PORTUGUESE: 200, Intermediate Portuguese; 201, Portuguese Composition; 202, Portuguese Conversation; 205, Introduction to Luso-Brazilian Literature; 207, Spoken Portuguese; 223, Culture and Civilization of the Portuguese-Speaking World; 225, Brazilian Culture; 232, Brazilian Literature through the Nineteenth Century; 233, Modern Brazilian Literature; 289, Independent Study; 294, Special Topics in Portuguese Language, Literature, or Civilization; 385, Seminar: Studies in Contemporary Literature of the Portuguese-Speaking World (Portugal, Brazil, Lusophone Africa); 397, Special Studies in Portuguese Literature; 398, Special Studies in Brazilian Literature.

SOCIOLOGY: 265, Psychological Anthropology; 270, Human Ecology and Society; 277, Contemporary Latin America; 279, Contemporary Mexican Society; 281, Development of a Small Planet; 390a–390b, Directed Studies.

SPANISH: 210, Spanish for the Legal Profession; 211, Spanish for the Medical Profession; 214, Dialectology; 216, Phonology; 218, Morphology and Syntax; 221, Spanish Civilization; 223, Spanish American Civilization; 230, Development of Lyric Poetry; 231, The Origins of Spanish Literature; 232, Literature of the Spanish Golden Age; 233, Modern Spanish Literature; 234, Contemporary Spanish Literature; 235, Spanish American Literature; 236, Contemporary Literature of Spanish America; 237, Contemporary Lyric Poetry; 239, Development of the Novel; 240, The Contemporary Novel; 244, Afro-Hispanic Literature; 246, Don Quixote; 260, Development of the Short Story; 272, Love in the Latin American Novel; 276, Going Native in Latin American Literature and Film; 289, Independent Study; 293, Contemporary Latin American Prose Fiction in English Translation; 314, Introduction to Latin American Colonial Studies; 333, Seminar: Modernismo; 334, Ordering and Disrupting Fictions in Latin America; 335, The Spanish American Novel of the Boom Period; 336, Self-Writing in Latin America; 337, The Melancholy Novel in Latin America; 338, Studies in Colonial Literature; 340, Seminar: Hispanic American Essay; 351, Comparative Methodology; 353, The Literature of Indianismo and Indigenismo; 354, The Politics of Identity in Latino U.S. Literature; 381, Seminar: Modern Spanish American Poetry; 386, Seminar: Contemporary Spanish American Short Story; 387, Contemporary Spanish American Novel; 389, Special Topics in Spanish American Literature; 398, Special Studies in Spanish American Literature.

In addition, qualified graduate students in the Latin American Studies program may, with appropriate permission, enroll in Special Topics (294) courses directly relating to Latin America.

Law and Economics

DIRECTORS W. Kip Viscusi and Joni Hersch
DIRECTOR OF GRADUATE STUDIES Joni Hersch
PROFESSORS Kathryn H. Anderson, Joni Hersch, W. Kip Viscusi
ASSISTANT PROFESSOR Paige Marta Skiba

DEGREE OFFERED: *Doctor of Philosophy*

✂ THE Ph.D. Program in Law and Economics combines analytical training in economic theory and methodology with the study of law. Upon completion of the program, students receive a Ph.D. in law and economics and a J.D. While one can separately earn a J.D. and a Ph.D. in economics, the Ph.D. Program in Law and Economics is distinctive in that training in economics is fully integrated with training in the law. Students who have already earned a J.D. may enter the Ph.D. program only. The Ph.D. degree is designed for students who wish to pursue careers in universities, research institutions, or government. It is not designed for students who wish to pursue careers in corporate finance.

The program is based in Vanderbilt Law School, and courses are taught by faculty in the law school, the Department of Economics, and Owen Graduate School of Management. Students receive a solid grounding in microeconomic theory, econometrics, and law and economics theory.

Students admitted to the Ph.D. program are required to complete 72 hours of course work and research. This includes a minimum of 45 hours of formal course work in core, field, and elective courses and 6 hours of Ph.D. Law and Economics Workshop. The core consists of 27 hours in law and economics theory, economic theory, and empirical analysis. Students are recommended to have completed courses in real analysis, statistics, linear algebra, and intermediate microeconomic theory.

After their first year of study, students select two fields of concentration from a pre-approved list of fields and begin taking the associated field courses. Currently, the list of identified fields includes behavioral law and economics, risk and environmental regulation, and labor and human resources. Field requirements include 12 hours of formal course work (6 hours in each field). In some circumstances, and with the consent of the director of graduate studies and program faculty, students are allowed to develop a new field.

After completion of the first full year of formal course work, all students must pass a written comprehensive examination in economic theory, law and economics theory, behavioral law and economics, and econometrics.

Detailed information is available upon request from program staff (e-mail lawecon@vanderbilt.edu) or from the program Web page, law.vanderbilt.edu/go/phdlawecon.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit]

399. Ph.D. Dissertation Research. [Variable credit]

401. Law and Economics Theory I. Principles of economic analysis as applied to legal issues. Topics include, among others, torts, property, litigation, and government regulation. [3]

402. Law and Economics Theory II. Analysis of the law and economics of legal rule making, civil and criminal procedure, law enforcement, and an introduction to antitrust. [3]

403. Behavioral Law and Economics I. Economic principles underlying behavioral law and economics research. Analyses of the rationality of individual choice will be undertaken, including research that involves the interaction of economics, psychology and decision sciences. Applications of behavioral law and economics methods will be applied to the analysis of jury behavior. [3]

404. Behavioral Law and Economics II. Research contributions at the frontier of behavioral law and economics research. Each student will structure a controlled experiment to test the rationality of jury behavior, the effect of alternative jury instructions, or a similar kind of scientifically controlled study of behavior relating to the performance of the legal system. Students will administer and analyze the survey results and will prepare an original research paper on their chosen topic. [3]

405. Econometrics for Legal Research. Analysis and critique of empirical legal research using advanced econometric techniques. Topics will be drawn from the program's core fields. Students will perform independent empirical research using primary data sources. [3]

406. Research in Law and Economics. Introduction to research methods and information in law and economics. Preparation and presentation of a research paper in law and economics. [2]

420. Labor Markets and Human Resources I. An introduction to labor market analysis and the law. Economic models of labor supply, labor demand, and human capital. Applications may include the analysis of discrimination, poverty, inequality, and welfare reform. [3]

421. Labor Markets and Human Resources II. An introduction to labor market analysis and the law. Applications may include the analysis of migration, health, education, social security, and pension reform. [3]

430. Risk and Environmental Regulation. Analysis of the sources of market failure that create a rationale for risk and environmental regulation. Methodologies pertaining to appropriate valuation and enforcement of these regulatory policies. Applications include procedures for estimating the value of statistical life, perception of risk, the role of hazard warnings, risk analysis by government agencies, and the enforcement of regulatory programs. [3]

490. Ph.D. Law and Economics Workshop. Research workshop on the presentation and interpretation of research and literature on law and economics. Topics vary with student and faculty interest. [Variable credit]

Leadership and Policy Studies

CHAIR James W. Guthrie

DIRECTOR OF GRADUATE STUDIES Robert L. Crowson Jr.

PROFESSORS John M. Braxton, Robert L. Crowson Jr., Ellen B. Goldring, James W. Guthrie,
Stephen P. Heyneman, Joseph Murphy

PROFESSOR OF THE PRACTICE Janet S. Eyster

ASSOCIATE PROFESSORS Robert Dale Ballou, Mark Berends, Mark D. Cannon,

Constance Bumgarner Gee, Michael K. McLendon, Thomas M. Smith, Claire E. Smrekar

ASSISTANT PROFESSORS William Doyle, Stella Flores, Christopher Loss, Liang Zhang

DEGREE OFFERED: *Doctor of Philosophy*

✦ THE Department of Leadership, Policy, and Organizations takes as its mission “to understand and enhance the social and institutional contexts in which learning occurs.” To fulfill this mission, the department engages in multidisciplinary social and behavioral science research, professional development of leaders, and outreach projects. Particular attention is devoted to the study of leadership, organizational theory, the sociology of education, the social context of education, issues in evaluation, and the politics and economics of education. Students are exposed to a wide array of inquiry tools, and both qualitative and quantitative research methodologies are highlighted. Interdisciplinary study is encouraged and fostered.

The department offers the Doctor of Philosophy degree in leadership and policy studies with specializations in educational leadership and policy, higher education leadership and policy, and international education policy and management. Each specialization has a set of required courses.

Specialization in Educational Leadership and Policy

The Ph.D. program in leadership and policy studies with a concentration in educational leadership and policy is designed for students who intend to build an academic career focused on the study of education and policy. As a Ph.D. student, enrollees will be matched with an LPO faculty member whose research interests align with their own. During their time in the department, students will apprentice with their faculty mentors to design individualized programs of study that reflect specific interests and backgrounds. As a student in the program, individuals will conduct research, present papers at scholarly conferences, and submit journal articles for publication. Upon completion, students will emerge with a program of research that will become a foundation for their professional and academic careers. The program will prepare participants for an academic career in a college or university, to enter the field of practice as a state or federal policy analyst, or to join a research group focused on the evaluation of education policy.

Transfer Hours: Up to 30 hours of transfer credit may be accepted in consultation with the student’s adviser.

Total Minimum Hours: 72 hours

Specialization in Higher Education Leadership and Policy

The Ph.D. program in leadership and policy studies with a concentration in higher education leadership and policy is designed for individuals wishing to pursue an academic career in the study of higher education and higher education policy. For students who intend to build a career in teaching and research, the Ph.D. program will provide a chance to collaborate with a faculty member. Students will be involved in research projects that might include topics such as a comparative study of international higher education policies; delineation of a normative structure for undergraduate college teaching or for college student behavior; an analysis of state higher education policy initiatives; or developing and testing theories of student persistence. Students will also spend time studying in a cognate field (such as sociology, organizational theory, or economics) to bring those theoretical traditions to bear on the study of higher education. Enrollees are expected to develop a program of research, present papers at academic conferences, and submit journal articles for publication.

Transfer Hours: Up to 30 hours of transfer credit may be accepted in consultation with the student's adviser.

Total Minimum Hours: 72 hours

Specialization in International Education Policy and Management

The international education policy management concentration is designed for those who intend to build an academic career dedicated to the study of education and its effect on social and economic development. It will prepare you for a career in university scholarship or to take an analytic leadership role in a development assistance agency or international education foundation. Students are trained to respond to education and social problems emanating from within the United States which may be assisted by international information and experience, and to primary, secondary, and higher education problems emanating from countries in any region. Building on LPO's considerable intellectual capital in school administration and higher education leadership, IEPM incorporates course requirements in both K-12 and higher education programs, but benefits from independent course work on human capital, international organizations, and trends in international education policy reform. An IEPM student would have the choice of focusing on educational challenges in either OECD or developing countries, and would utilize any of the social sciences such as economics, sociology, political science, and anthropology in pursuit of those interests.

Transfer Hours: Up to 30 hours of transfer credit may be accepted in consultation with the student's adviser.

Total Minimum Hours: 72 hours

Requirements for All Specializations

I. Social Science Core Requirements (12 hours)

- 3460 Politics of Education
- 3560 Sociology of Education
- 3530 Economics of Education
- 3460 Comparative Intern. Ed. Policy

II. Specialty Ph.D. Seminars (ELP–9 hours; HELP–15 hours)

- Seminar I
- Seminar II
- Seminar III
- Seminar IV
- Seminar V

III. Research Tools (18 hours)

- Research Design and Methods
- Intro to Statistics
- Quantitative Research Methods (Regression)
- Qualitative Research Methods
- Tool Elective 1
- Tool Elective 2

IV. Research Practicum (6 hours)

V. Electives (15–21 Hours)

Ph.D. Social Science Core Classes

3460. Comparative Issues Education Policy Reform. Examines K–12 and higher education from an international/comparative perspective. The intent of the course is to provide students the framework for examining and evaluating contemporary education issues comparatively. [3]

3530. Economics of Education. This course focuses on problems of the American educational system. Most attention will be paid to primary and secondary education (grades K–12), although some issues in higher education will also be examined. The goal of the course is not merely to study what economists have said about the problems of American education, but to understand (and use) economic tools of analysis. These tools are of wide applicability and illuminate educational policies and practices (and much else) in all nations and societies. Although the focus is on the U.S., the course will be valuable to students whose principal interest is in international issues and educational systems abroad. [3]

3540. Governance and Politics in Education. This course deals with a central question in political science and public policy—How can public institutions be redesigned to improve accountability? This question is examined with particular attention to governance and politics in public school systems. Specifically, students will examine three sets of issues: (1) What is the role of politics in allocating resources in public schools? (2) What are key political challenges in the governance of urban school systems? (3) What is the politics of school choice? [3]

3600. Social Context of Education. Explores contemporary social, philosophical, and political dimensions of education and their relationship to leadership, including issues related to social class and culture, democracy and diversity, and equality and choice. [3]

Educational Leadership and Policy/School Administration Elective Courses

3500. Resource Allocation and Deployment. This course covers resource allocation issues for lower and higher education, public and private education, and United States and overseas education. "Resource," in this context principally, but not exclusively, refers to financial resource. The purpose of this course is to introduce participants to the means by which answers can be framed for questions such as: Who pays for education? Who goes to school and who benefits from schooling? How much does education cost? How can resources be used to influence the trajectory of an organization? And how can resources for education be spent more efficiently? Additionally, the course is intended to enable participants to gain and enhance analytic and information gathering skills related to education finance and resource allocation. [3]

3510. U.S. Education Reform. This course is designed to: (1) increase students' familiarity with and understanding of select key issues in current school reform efforts; (2) enable students to systematically evaluate research on both sides of debates about particular types of school reforms, such as comprehensive school reform and standards-based reform; (3) increase students' ability to access and properly utilize research on school reform to inform analysis, evaluation, decision-making, and implementation; and (4) improve students' skills in oral and written analysis and presentation. [3]

3512. International Innovations in K–12 Policy Reform. Schooling is now compulsory throughout the world, but rarely are the resources sufficient to fund it adequately. Schooling in democracies takes on similar characteristics in the effort to respond to the public's open demands. This course reviews the policy changes of school systems in meeting these two challenges. The course concentrates on Western Europe, but expands to Asia, Africa, Latin America, the Middle East and North Africa, and Eastern Europe and Central Asia depending on student interest. [3]

3520. Instructional Leadership. Examines issues of school improvement and instructional leadership from the perspective of effective schools literature. [3]

3550. Education Policy and School Law. Study of the general structure, theory, and background of the law as it applies to schools. Attention given to constitutional issues, negotiation problems, procedures, court decisions, and how to read a case. [3]

3620. Doctoral Seminar in Education Policy. This course offers an "analytical foundation" for doctoral students who are interested in policy research. This seminar is open to doctoral students at various stages of their dissertation project—ranging from initial exploration of topics to the more advanced phase of drafting dissertation chapters. The course is designed to enhance various analytical skills of doctoral students including: (1) to develop a systematic understanding of the intellectual evolution of various key concepts in the field of educational policy, governance, politics, and organization; (2) to examine, in a critically constructive fashion, various theoretical approaches; (3) to learn about current debate on major issues in policy research; (4) to improve the organization of writing an academic research paper in educational policy. [3]

3640. Education and Economic Development. This course reviews the history and application of human capital theory. It provides students with examples of its application in economic development policy and gives practice in applying common statistical models. It exposes students to current debates in education policy in the World Bank and other international organizations which result from those models. [3]

*Higher Education Leadership and Policy/Higher Education Administration
Elective Courses*

3710. The Academic Profession: Structure and Roles. This course focuses on the structure of the American academic profession with particular attention concentrating on institutional and disciplinary differences among college and university faculty. The teaching and research role performance of college and university faculty as well as the various psychological, sociological, and organizational forces that shape the performance of these professional roles are also examined. Additional topics include the assessment of teaching and research activities of college and university faculty members. [3]

3720. The College Student: Structure, Processes and Effects. Study of the college student in contemporary society with focus on characteristics of students admitted and retained, impact of the college on the student, student values, and peer group influence. [3]

3730. State and Federal Government and Higher Education. This course is a seminar for advanced graduate students which focuses on the intersection of institutions, actors, and processes that result in the formation of public policy for higher education at both the state and federal levels of American government. It pursues this focus by examining the fluid political environment in which government operates, the fundamental conflicts governments act to mediate, the governmental process by which policies are formulated and the outcomes of policies that are enacted. The course emphasizes both the varied theoretical perspectives on the formation of higher education policy and the numerous contemporary policy challenges confronting campus and state officials. [3]

3740. Comparative Issues in Higher Education Policy Reform. Examines higher education from an international/comparative perspective. The intent of the course is to provide students the framework for examining and evaluating contemporary higher education issues comparatively. [3]

3750. Social and Racial/Ethnic Diversity. This course covers a variety of issues regarding diversity in higher education. In drawing from the literature and research on faculty, administration, and students, the course provides an overview of critical issues currently facing institutions of higher education in our society. [3]

3800. The Nature and Function of American Higher Education. Historical study of the functions of American higher education and an examination of contemporary issues. [3]

3810. College and University Curriculum. Investigation into current curriculum trends and models. Review of recent practices and intensive attention to new and emerging curriculum models and relevant social and educational forces. [3]

3820. Service-Learning in Higher Education. This class engages students in the analysis and application of the theory of service-learning, i.e., the integration of community service and related academic study. Students will assist a service-learning program in higher education (or K-12, if appropriate) with planning, implementation, or evaluation, and integrate this experience with study of current theory and research. [3]

3830. Literature and Research in Higher Education. Introduction to the chief literature, major research tools and methods, and significant research and development centers of higher education in the United States. [3]

3840. The Role and Function of the American Community College. An overview provides a critical examination of issues in higher education in general and community colleges in particular. Explores the historic development, distinctive types, purpose, and roles of two-year colleges; the community-college student; the training and qualifications of two-year college faculty; and the structure and organization of two-year colleges. [3]

3851. Institutional Advancement Proseminar I. Focuses on alumni relations, government relations, public relations, publications and use of direct mail in colleges and universities, and the nature and function of philanthropy. Students will perform a number of class and group projects, and speakers will address the class. [3]

3852. Institutional Advancement Proseminar II. Comprehensive review of annual and capital campaigns, donor research, writing proposals, annual fund campaigns, and deferred giving for colleges and universities. Students will do class projects, and speakers will address the class. [3]

3853. Strategic Marketing and Planning in Higher Education. Comprehensive review of marketing and planning for higher education, consumer behavior, market research planning, target marketing, segmentation and strategic planning, and the relationship of marketing and planning to higher education. Course utilizes case studies. [3]

3860. College Student Personnel Services. Explores the history, philosophy, objectives, and organization of student personnel services with reference to orientation, residential and off-campus living, health services, guidance and counseling, student activities, foreign student advising, religious affairs, etc. [3]

3861. Theories of College Student Development. Students will explore various theories of college student development and will discuss their strengths and limitations. Through the course, participants will develop an understanding and the ability to apply these theories as practicing student affairs professionals. Course activities include discussion, classroom presentations, group activities, and lecture. [3]

3870. College and University Teaching. A study of the teaching-learning process while developing understanding of the relationship of the teacher, the student, and the particular discipline involved in the instructional process. [3]

3880. Law and Higher Education. Explores the constantly growing relationship between basic law and higher education. Seeks to acquaint the student with benchmark laws and court decisions and the resulting implications for higher education. [3]

3890. College and University Finance. Current issues in financing higher education, sources of revenue, methods of justifying requests for funds. Includes budgeting procedures, allocation systems, budget controls, and the relation of planning to budgeting. Course is for the generalist faculty member or general administrator, not for fiscal specialists. [3]

Methods Courses

3460. Regression Analysis.

3461. Regression Analysis II.

3460–3465. Special Topics. Explores special issues or topics related to education. May be repeated. [1–6]

3460. Special Topics in Education.

3461. Special Topics in School Administration.

3462. Special Topics in Higher Education Administration.

3463. Special Topics in Human Resource Development.

3464. Special Topics in Education Policy.

3465. Special Topics in Organizational Leadership.

3470. Individual Study. Semi-independent study on selected topics in education. May be repeated. Consent of instructor required. [1–3]

3908. Decision Analysis V: Survey Methods. This is an introductory graduate course on quantitative survey research methods, with an emphasis on surveys in organizations. The objective is to provide students with the knowledge and tools necessary to design, conduct, and interpret organizational surveys (and the resulting data). [3]

3910. Modeling Context Effects in Educational Organizations. This seminar explores the methodological challenges and substantive implications of studying schools as complex organizations. Substantively, this course covers the literature on school effects, moving from early input-output studies to current research that examines the organizational context of schools, particularly the impact of within and between school stratification on student outcomes. Methodologically, this course provides an introduction to hierarchical linear modeling, including the conceptual background of hierarchical models, preparing data sets for use with HLM software, using the HLM software, strategies for analysis of data, applications of two- and three-level models, interpreting HLM output, and presenting results.

Individual Study Courses

3930–3935. Research in Education. Individual programs of research in various education fields. Consent of faculty supervisor required. May be repeated. [1–6]

3930. Research in Education.

3931. Research in School Administration.

3932. Research in Higher Education Administration.

3933. Research in Human Resource Development.

3934. Research in Education Policy.

3935. Research in Organizational Leadership.

3940–3945. Field Experiences in Education. Individual or group opportunities for observation or other activities in a field setting by arrangement between a local school system or other educational agency, the student, and the supervising professor. Consent of faculty supervisor required. May be repeated. [1–6]

3940. Field Experiences in Education.

3941. Field Experiences in School Administration.

3942. Field Experiences in Higher Education Administration.

3943. Field Experiences in Human Resource Development.

3944. Field Experiences in Education Policy.

3945. Field Experiences in Organizational Leadership.

Research Courses

3790. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

3970. Master's Thesis in Education. Open only to M.Ed. candidates engaged in thesis project. Consent of major professor required. [1–6]

3990. Doctoral Dissertation.

Learning, Teaching, and Diversity

INTERIM CHAIR David Dickinson
 ASSOCIATE CHAIR Marcy Singer-Gabella
 DIRECTOR OF GRADUATE STUDIES Leona Schauble and Clifford Hofwolt
 PROFESSORS EMERITI Jerold P. Bauch, Carolyn M. Evertson, Elizabeth Spencer Goldman,
 Charles B. Myers, Robert Whitman
 PROFESSORS Paul A. Cobb, David Dickinson, Dale C. Farran, Rogers Hall, Robert Jimenez,
 Richard Lehrner, Victoria J. Risko, Leona Schauble
 PROFESSOR OF THE PRACTICE Marcy Singer-Gabella
 PROFESSOR OF THE PRACTICE EMERITA Earline D. Kendall
 ASSOCIATE PROFESSORS Clifford A. Hofwolt, Kevin M. Leander, Henry Richard Milner,
 Deborah W. Rowe
 ASSOCIATE PROFESSORS OF THE PRACTICE Ann M. Neely, Lisa Pray
 ASSISTANT PROFESSORS Bridget Dalton, Carin Neitzel
 ASSISTANT PROFESSORS OF THE PRACTICE Marie Hardenbrook, Melanie Hundley,
 Amy Palmeri, Emily Shahan
 ASSISTANT CLINICAL PROFESSOR Karon LeCompte
 RESEARCH ASSISTANT PROFESSOR Alene Harris
 SENIOR LECTURER Ann Kindfield
 LECTURERS Steven Baum, Andrea Henrie, Deborah Lucas-Lehrer, Catherine McTamaney,
 Jeanne Peter, Sharon Yates
 TEACHER-IN-RESIDENCE Christian Sawyer

DEGREES OFFERED: *Master of Science, Doctor of Philosophy*

✦ THE graduate program in learning, teaching, and diversity offered by the Department of Teaching and Learning is designed for persons who will conduct research on teaching and learning processes and who will pursue careers as education faculty members at research universities. The program admits a very select number of students with strong academic credentials who have had experience in K–12 education and are interested in working closely with the faculty in research and development projects.

Programs of study for the Doctor of Philosophy include (a) a core set of courses that develops a knowledge base in the areas of learning theory and classroom processes; (b) a specialization area, developed in conjunction with a faculty adviser, which focuses on an area of research such as classroom processes, young children's learning, or applications of technology to instruction; (c) a minor area, either within the department or in a related area; and (d) research methodology courses including statistics and research design.

Students admitted to the Doctor of Philosophy program in learning, teaching, and diversity may obtain a Master of Science degree with a major in learning, teaching, and diversity upon completion of 42 semester hours and the completion of either a thesis or the major area paper.

Post-baccalaureate professional degree programs (M.Ed.) are offered through Peabody College. Information regarding these programs is available in the Peabody College catalog.

Education

2040. Introduction to Classroom Technologies. An introduction to various technologies used in classrooms with an emphasis on microcomputer-based technologies. Meets licensure requirements for preservice teachers. Credit for M.A.T. students only. FALL, SPRING. [1] Staff.

3002. Internship in Teaching: Secondary. Observation, participation, and teaching in graduate intern centers and/or schools. Post-baccalaureate equivalent of student teaching. May be repeated to provide experiences at different levels. FALL, SPRING. [6] Staff.

3007. Internship Seminar: Secondary. Seminar to accompany EDUC 3002. FALL, SPRING. [1] Staff.

3040. Teaching as a Social Practice. This course provides an investigation into teaching as situated in the social context of the school and school district. Classroom observations in tandem with a series of readings are the basis of the course. Assignments are intended to provide students opportunities to coordinate important aspects of the readings with observation of practice. [3] McClain.

3050. Advanced Social and Philosophical Aspects of Education. Exploration of the interaction between contemporary social problems and various philosophies in relation to educational theory, policy, and practice. FALL, SPRING, SUMMER. [3] Smrekar.

3070. Inquiry into Education. An introduction to the function and means of various practices of educational research. Promotes understanding of the language of educational inquiry, aims and uses of research, various ways of framing research questions and designing studies, and procedures for obtaining, analyzing, and interpreting qualitative and quantitative data. Presents issues of procedure or design and related issues of validity; construct definition and data generation, instrumentation and data collection; and data quality, meaning, appropriateness, credibility, and inferences made based on data. FALL. [3] Neitzel.

3080. Diversity and Equity in Education. Provides an introduction to the structural, systemic, and institutional dimensions and complexities of diversity that often emerge in education across multiple contexts. Central constructs of the course include race, culture, SES, gender, language, achievement, policy, epistemology, and learning. FALL. [3] Milner.

3110. Psychological Foundations of Education. (Also listed as Psychology and Human Development 334P) Psychological theories and research as related to the design and practice of education. Specific consideration of the developmental bases of teaching, learning, and student performance (early childhood through adult); individual differences in education with particular reference to socioeconomic status, disabling conditions, learning style, and gender; evaluation of learning; classroom and organizational influences on school effectiveness; family-school relations. FALL, SPRING. [3] Staff.

3120. Learning and Instruction. Introduces theories of learning and explores their utility for the design of learning environments. Contrasts sociocultural and cognitive approaches toward concepts and categories, problem solving, and model-based reasoning. FALL. [3] Lehrer.

3170. Analysis of Teaching. Use of objective and unobtrusive evaluation procedures and methodologies in a variety of educational settings. Emphasis on theoretical base for qualitative and quantitative evaluation and methodologies. Experience given in collecting, processing, summarizing, and reporting data. SPRING. [3] Baum.

3200. Foundations in Learning and Development. Provides a foundation in relevant developmental milestones related to children's academic behaviors from pre-kindergarten through high school. Children's development and learning are viewed in the context of school expectations with an emphasis on the diversity among learners. [3] Farran.

3210. Theories and Curriculum Models in Early Childhood Education. Compares models of current interest in curriculum, materials, methods, and staff roles. Observation in a variety of local early childhood education programs. SPRING. [3] Staff.

3220. Parents, the School, and the Community . Parent participation, parent education, and community involvement in school programs. Laboratory experiences in school settings examine ecological influences and environmental transactions among the home, school, and community. SPRING. [3] Staff.

3230. Administration and Supervision of Early Childhood Programs. Selection, training, and supervision of staff; working with regulatory agencies, boards, funding sources, and parents; evaluation of program components; and exploration of administrative theory and practice. [3] Staff. (Not currently offered)

3240. Seminar in Early Childhood Education. Relevant research as the basis for formulating policies and program development guidelines. Different topics emphasized each time course is offered. May be repeated for credit with change of topic. [3] (Not currently offered)

3250. Advanced Seminar in Early Childhood Education. Emphasizes research, theory, and policy making that bear on current practice. Intended primarily for post-master's degree students. FALL. [3] Staff.

3260. Observation and Curriculum Planning. Survey of a variety of observation and assessment techniques used to inform curriculum planning for young children. The focus of the course is on using formative assessment to plan instruction based on students' developing understandings. Also considers 1) use of formative assessment, 2) relations between formative and summative assessment, 3) working with other professionals to plan and conduct assessments, and 4) ways to collaborate and communicate with families. [3]

3370. Literacy Assessment and Professional Development. Study of literacy assessment research and practices, multiple opportunities for collecting and analyzing data using multiple assessment tools, and methods for implementing diagnostic findings in PreK-12 settings, emphasizing corrective instruction. Attention is given to professional development of teachers and paraprofessionals in areas of literacy development and methods for communicating the use of assessment information to guide instructional decisions. [3] Risko.

3380. Seminar in Language and Literacy Education. Emphasis on current literacy research and topical issues. Designed to meet the needs of professional students with a major in language and literacy education. Prerequisite: EDUC 3390 or 3420. [1-3] (Not currently offered)

3390. Literacy Development. Survey of theories and approaches to developing reading and writing in school-based settings. In-depth development of theory and research related to literacy development, with an emphasis on reading/writing processes and instruction. [3] Rowe.

3420. Literacy for Diverse and Special Needs Learners. Emphasis on theories, research, philosophies, principles, and procedures associated with approaches to literacy instruction for students experiencing problems with literacy development. Analysis of multiple factors and handicapping conditions contributing to literacy difficulties and how these affect diagnostic and instructional outcomes. Focus on methodologies for accommodating literacy problems in regular classrooms and special settings, and communicating with professionals, parents, and paraprofessionals. [3] Risko.

3440. Issues and Trends in Literacy Instruction. Issues and trends in literacy, including reading in a pluralistic society, early reading, adult reading, intervention strategies, and appraisal and measurement. FALL. [3] Risko.

3450. Psycholinguistic Aspects of Language and Literacy. Designed to provide a theoretical base for evaluating recent developments in the field of language and literacy from a psycholinguistic perspective. SPRING. [3] Staff.

3460. Teaching and Learning the Language Arts: Theory and Research. Provides in-depth study of theory and research on teaching and learning the language arts (reading, writing, speaking, and listening) and related literacies (e.g., art, drama). Special emphasis is given to writing development and the teaching of writing in the preschool and elementary years. FALL. [3] Rowe.

3470. Social Aspects of Language and Literacy. Introduces social and cultural theories of language and literacy learning and teaching, and the research questions and methods associated with them. Includes study of sociocultural, sociolinguistic, semiotic, anthropological, and critical theory approaches to the study of literacy learning and use. [3] (Not currently offered)

3500. Foundations of Education. Introduction to schools, classrooms, teaching, and the nature of students and learning. Intended for master's degree students who are in the early stages of preparing for licensure as early childhood, elementary, or secondary school teachers. SUMMER, FALL. [3] Harris, Hofwolt.

3510. Advanced Teaching in Secondary Schools. Exploration of teacher decision making regarding classroom climate, curriculum, and classroom management in secondary schools. A practicum in secondary schools is included. SPRING, SUMMER. [3] Harris.

3530. Foundations for ELL Education. This course examines the theoretical, historical, political, legal, and research bases for the education of students from linguistically and culturally diverse populations. Program models and the theoretical bases for these models are covered in this course. National policies and current issues relevant to the learning of English language learners are emphasized. [3]

3540. Methods and Materials for ELL Education. This course focuses on bilingual (native language and ESL) curriculum development and instruction for students (peK–12) in a variety of language and program settings. Second-language instructional theory and practice, materials selection and development for LEP children, and bilingual and ESL literacy and content area instruction (mathematics, science, social studies, English education) are covered. Frameworks for evaluating curriculum materials and their instructional recommendations for ELL students are provided. [3]

3550. Multicultural Education in Today's Classrooms. This course reviews many of the social and cultural factors that affect the learning and teaching of culturally and linguistically diverse students, including Limited-English-Proficient students. The course introduces students to the fields of educational anthropology and multicultural education and to the application of cultural information to curriculum development and classroom practice. The research base for modifying and adapting instructional approaches to the needs of ELL students is a featured aspect of this course. [3]

3560. Acquisition and Assessment of ELL Students. This course focuses on understanding the processes of second language acquisition/learning/development and individual, cognitive, and social factors that influence second language learning in North America (particularly in the United States). In addition, theoretical and practical aspects of language testing for second-language learners are covered. Instruments used by educators to assess the language proficiency and academic achievement of linguistically diverse students are presented and demonstrated. The course examines the purposes and types of language tests in relation to theories of language use and language teaching goals; discusses testing practices and procedures related to language teaching and language research; and includes the planning, writing, and administration of tests, basic descriptive statistics, and test analysis. Rubrics for relating assessment information to instruction and program planning are developed within this course. [3]

3570. Practicum for ELL Education. The purpose of this course is to help students develop necessary dispositions, knowledge, and skills for teaching English language learners through situated learning experiences. Students will participate in a field-based practicum working with students who are English language learners. Their experience will include use of either students' native languages and/or ESL instructional components. Identification of factors that facilitate and/or impede ELL student learning within specific contexts is a required outcome of the practicum. Students involved in the practicum will meet with a university faculty member on a bi-weekly basis to assess their progress in the field. [3]

3610. Curriculum Foundations. Critical analysis of historical and contemporary curricula research, theory, and practice in public schools and other learning contexts. FALL. [3]

3620. Principles of Curriculum Development. Examines curricula theory and practice on multiple levels in designing responsive curricula. Emphasis on understanding complex processes in curriculum development. SPRING. [3]

3690. Master's Thesis Research.

3700. Research Groups. Examination of a research issue of mutual interest in a year-long study. Multiple topics will be offered. May be repeated. [0, 3]

3790. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

3810. Discourse Analysis in Education. This course provides a rigorous introduction to the analysis of discourse in educational contexts. The course draws on critical discourse analysis, sociocultural approaches, and other traditions to consider relations of learning, identity, and power in educational texts and communicative activity. The course provides experience and instruction through processes of data collection, transcription, and analysis. SPRING. [3] Leander.

3890. Individual Study in Education. Semi-independent study on selected topics in education. May be repeated. Prerequisite: consent of instructor. FALL, SPRING. [Variable credit: 1–3] Staff.

3900. Special Topics in Education. Special issues or topics related to education. May be repeated. FALL. [Variable credit: 1–3] Staff.

3911. Methods of Educational Research: Quantitative. Survey of modes of conceptualization, problem identification, and research design. Development of skills, principles, and techniques of quantitative research, and the analysis, interpretation, and effective presentation of results. Lectures and group discussions and critiques in seminar format. [3] (Not currently offered)

3912. Methods of Educational Research: Qualitative. Covers issues and strategies involved in collection and analysis of qualitative data. Focuses on the assumptions and related research techniques of qualitative research, framed by the post-positivist paradigm (i.e., naturalistic inquiry, ethnography). SPRING. [3] Rowe.

3921. Ethnographic and Qualitative Research in Education. This course provides in-depth knowledge of and skill with ethnographic and qualitative research theory and methods as applied to educational issues. This is the first of a two-course sequence. [3] (Not currently offered)

3922. Ethnographic and Qualitative Research in Education. This course provides in-depth knowledge of and skill with ethnographic and qualitative research theory and methods as applied to educational issues. This is the second of a two-course sequence. [3] (Not currently offered)

3930. Research in Education. Individual programs of research in various education fields. Prerequisite: consent of faculty supervisor . May be r epeated. FALL, SPRING. [Variable credit: 1–6] Staff.

3990. Ph.D. Dissertation Research.

English Education

2920. Literature for Adolescents. Literary works appropriate to readers of middle-school and high-school age. Materials for readers of varying abilities. FALL. [3] Staff.

3000. Teaching Literature in the Preschool and Elementary Classrooms. Introduces students to the study of the field of children's literature and the principles of teaching literature in school settings. [3] Neely.

3007. Internship Seminar: Secondary. Seminar to accompany EDUC 3002. [1] Staff.

3020. Teaching Composition in the Secondary School and College. The objectives, organization, content, methods, and special problems of teaching composition. SUMMER. [3] Staff.

3030. Teaching Literature in the Secondary School and College. The objectives, organization, content, methods, and special problems of teaching literature. FALL. [3] Staff.

3040. Perspectives on the English Language. Introduction to English linguistics and to public and school issues related to the subject. For teachers and prospective teachers of English/language arts. SPRING. [3] Staff.

3220. Theory and Research in Composition Education. Composition theory and research as applied to education; examination of writing theory and practice at all levels. [3] (Not currently offered)

3230. Theory and Research in Literature Education. Literature theory and research as applied to education; examination of teaching and learning of literature at all levels. [3] (Not currently offered)

3370. English Education Theories and Practices. Explores theories and methods for teaching the English language arts in secondary schools with an emphasis on the teaching of composition. Corequisite: EDUC 236. [3] Leander.

3380. Advanced Teaching of Writing in Secondary Schools. Designed to encourage student teachers to examine the complexities of teaching writing in middle and high school settings and to develop a theoretically sound methodology that will allow them to design meaningful, engaging, and thoughtful writing instruction. FALL. [3] Hundley.

3400. Teaching Reading in the Content Areas. Study of approaches to improving reading instruction in middle and secondary schools. SPRING. [3] Staff.

3500. Advanced Study of Literature for Children and Adolescents. Designed to provide students who already have introductory experiences in children's and adolescent literature advanced study in the field. A variety of current topics relevant to the field of study will be explored. SPRING. [3] Neely.

3690. Master's Thesis Research.

3790. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

3890. Individual Study in English Education. Semi-independent study of selected topics in English education. Prerequisite: consent of supervising instructor . May be r epeated. FALL, SPRING. [Variable credit: 1–3] Staff.

3900. Special Topics in English Education. May be repeated with change of topics. [Variable credit: 1–3] (Not currently offered)

3930. Research in English Education. Individual program of research in English education. Prerequisite: consent of supervising instructor. May be repeated. FALL, SPRING. [Variable credit: 1–6] Staff.

3960. Internship in English Education. Supervised on-site experience in a professional role, as teachers, research associates, aides, or other members of professional teams. Prerequisite: consent of major professor. FALL, SPRING. [Variable credit: 1–12]

3990. Ph.D. Dissertation Research.

Foreign Language Education

2370. Teaching Foreign Language in Secondary Schools. Fundamentals of language learning and techniques of teaching. Required for secondary-school licensure in foreign languages. Credit for students seeking teacher licensure only. FALL. [3] Staff.

3007. Internship Seminar: Secondary. Seminar to accompany EDUC 3002. [1] Staff.

Mathematics Education

3007. Internship Seminar: Secondary. Seminar to accompany EDUC 3002. [1] Staff.

3250. Advanced Teaching of Mathematics in the Elementary School. Foundations of elementary school mathematics and pedagogy for teaching this content will be examined. Problem solving, mathematical modeling, the language of mathematics, instructional techniques, and ways in which children learn mathematics will be emphasized. FALL. [3] Cobb.

3370. Advanced Teaching of Mathematics in Secondary Schools. A study of teaching and learning mathematics in middle and secondary schools with particular emphasis on the theoretical and research bases for classroom practice. Examines pedagogies that increase student understanding with particular emphasis on such secondary school mathematics topics as: functions, the arithmetic to algebra transition, geometry, spatial thinking, problem-centered learning, proof, history of mathematics and its relationship to other fields. Intended only for master's degree students seeking initial licensure. FALL. [3] Staff.

3690. Master's Thesis Research.

3790. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

3810. Cognitive Theories of Mathematical Learning. (Also listed as Psychology and Human Development 381P) Examines the research literature on mathematical learning at the elementary and secondary levels. Considers both the epistemological assumptions and implications of information-processing theories, situated cognition theories, activity theory, and constructivism. SPRING. [3] Cobb.

3840. Social and Cultural Aspects of Mathematics Education. Examines the research literature on the social and cultural aspects of mathematics learning and teaching at the elementary and secondary level. Considers the coordination of psychological and social perspectives in mathematics education and deals with the implications for the development of instructional activities. [3] Cobb.

3890. Individual Study in Mathematics Education. Semi-independent study on selected topics in mathematics education. May be repeated. Prerequisite: consent of supervising instructor. FALL, SPRING. [Variable credit: 1–3] Staff.

3900. Special Topics in Mathematics Education. Seminars, conferences, workshops, or field activities focused on current issues. May be repeated. [Variable credit: 1–3] (Not currently offered)

3910. Investigations in the Teaching of Elementary-School Mathematics. Current issues and research. Application to classroom instruction. SPRING. [3] Staff.

3920. Investigations in the Teaching of Secondary-School Mathematics. Research in literature of mathematics education at the secondary-school level. [3] (Not currently offered)

3930. Research in Mathematics Education. Individual program of research in mathematics education. Prerequisite: consent of supervising instructor. May be repeated. FALL, SPRING. [Variable credit: 1–6] Staff.

3990. Ph.D. Dissertation Research.

Science Education

3007. Internship Seminar: Secondary. Seminar to accompany EDUC 3002. [1] Staff.

3300. Investigations and Trends in Science Education. Science teaching and science curricula at the middle-school and senior high-school level. Philosophies, teaching strategies, materials, and research. FALL. [3] Hofwolt.

3370. Advanced Teaching of Science in Secondary Schools. Study of theory, research, issues, curriculum approaches, trends, and modern approaches of teaching science in secondary schools. Intended only for master's degree students seeking initial licensure. FALL. [3] Catley.

3400. Philosophy of Science and Teaching. Examines how the historical and epistemological foundations of the structure of knowledge can be applied to the design and evaluation of curriculum, instruction, and assessment models. Prerequisite: PHIL 244, a course in cognitive psychology, or permission of the instructor. [3] Staff. (Not currently offered)

3690. Master's Thesis Research.

3790. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

3890. Individual Study in Science Education. Semi-independent study on selected topics in science education. May be repeated. Prerequisite: consent of supervising instructor. FALL, SPRING. [Variable credit: 1–3] Staff.

3900. Special Topics in Science Education. May be repeated. [Variable credit: 1–3] (Not currently offered)

3930. Research in Science Education. Individual program of research in science education. Prerequisite: consent of supervising instructor. May be repeated. FALL, SPRING. [Variable credit: 1–6] Staff.

3990. Ph.D. Dissertation Research.

Social Studies Education

3007. Internship Seminar: Secondary. Seminar to accompany EDUC 3002. [1] Staff.

3370. Advanced Teaching of Social Studies in Secondary Schools. A study of theory, research, and practice in secondary-level social studies. Students will examine multiple and conflicting purposes of social studies instruction and develop curricular models and pedagogical strategies for effective practice. Competencies that reflect effective social studies teaching practices will be developed. FALL. [3] Staff.

3890. Individual Study in Social Studies Education. Semi-independent study on selected topics in social studies education. May be repeated. Prerequisite: consent of supervising instructor. FALL, SPRING. [Variable credit: 1–3] Staff.

3900. Special Topics in Social Studies Education. May be repeated. [Variable credit: 1–3] (Not currently offered)

Liberal Arts and Science

DIRECTOR Martin Rapisarda

DEGREE OFFERED: *Master of Liberal Arts and Science*

✦ THE Master of Liberal Arts and Science degree program offers part-time, adult students the opportunity to earn an interdisciplinary, nontraditional graduate degree.

Each course generally meets one night per week, and students select one course per semester. While the program is designed primarily for personal enrichment, students often discover important professional career benefits as well. The requirements and curriculum provide flexibility in program design and course selection, and the tuition, scheduling, admission, and registration procedures acknowledge the special circumstances of the part-time adult student.

Specific titles, topics, and instructors of courses are available for each semester from the director of the Master of Liberal Arts and Science degree program. Requirements for the degree are listed in the chapter on Academic Regulations in the front of this catalog. Prospective students may also consult the Web site for additional information: www.vanderbilt.edu/mlas.

MLAS 260. Seminar in Humanities. [3]

MLAS 270. Seminar in Social Science. [3]

MLAS 280. Seminar in Natural Science. [3]

MLAS 290. Interdisciplinary Seminar. [3]

*Selected Topics***MLAS 310. Selected Topics in Humanities.** [3]**MLAS 320. Selected Topics in Social Science.** [3]**MLAS 330. Selected Topics in Natural Science.** [3]**MLAS 340. Interdisciplinary Selected Topics.** [3]**MLAS 369. Master's Thesis Research.** [0–3]

Management

DEAN James Bradford

DIRECTOR OF THE PH.D. PROGRAM Clifford A. Ball

PROFESSORS EMERITI J. Dewey Daane, David L. Rados, H. Martin Weingartner

PROFESSORS Clifford A. Ball, Bruce Barry, Joseph D. Blackburn Jr., Robert Blanning, Germain B. Böer, Paul K. Chaney, William G. Christie, Mark A. Cohen, Bruce Cooil, Richard L. Daft, David Dilts, Raymond A. Friedman, Dawn Iacobucci, Larry J. LeBlanc, Craig M. Lewis, Salvatore T. March, Ronald W. Masulis, Richard L. Oliver, David C. Parsley, Gary D. Scudder, Hans R. Stoll, Bart Victor, Robert Whaley

CLINICAL PROFESSORS James Bradford, Michael Burcham, William I. Henderson, Jon Lehman, Bruce Lynskey, Neta Moye, Frederick Talbott

ASSOCIATE PROFESSORS Nicolas Bollen, Jennifer Escalas, Luke M. Froeb, Tim Gardner, Karl Hackenbrack, Steven Hoeffler, Nancy Lea Hyer, Nicole Jenkins, Debra C. Jeter, Michael Lapré, Steven Posavac, Rangaraj Ramanujam, Jacob Sagi, Larry Van Horn, Richard Willis

ASSISTANT PROFESSORS Mumin Kurtulus, Alexei Ovtchinnikov, Mikhael Shor, Timothy Vogus

CLINICAL ASSISTANT PROFESSOR Kimberly Pace

DEGREE OFFERED: *Doctor of Philosophy*

✎ THE Doctor of Philosophy degree in management is designed to prepare students for academic careers in teaching and research. The program is small and highly selective and fosters close student-faculty interaction in an atmosphere that is collegial and intellectually challenging. At the time of admission, students are accepted into one of the three specializations currently offered in the Ph.D. program: finance, organization studies, and marketing.

To receive the Ph.D. in management, students complete 36–48 hours of formal course work, pass written and oral examinations, and demonstrate scholarship in a dissertation. The program is designed to allow students to satisfy the requirements for the Ph.D. within four years of study. Financial support that covers tuition and living expenses for four years is available for most students.

Students in the program select courses from among the offerings of the Owen Graduate School of Management as well as from other departments

of the University. Courses within the Owen School are sometimes taken as enhanced versions of M.B.A. electives, with the instructor imposing additional or alternative requirements for doctoral credit. Owen School semesters are divided into two seven-week modules, with most courses lasting one module and carrying 2 hours of credit.

In the field of specialization, a student generally takes at least four courses plus at least two courses in an approved minor field. Specific requirements and course sequences vary by area. Beyond the specialization and its underlying disciplines, there is a breadth requirement that students pass one course in each of the other functional fields of management. (Students with relevant prior course work can seek a waiver of the breadth requirement in whole or in part.) Each student is also required to take two courses in economics and a minimum of four appropriate courses in statistics, research methodology, and/or mathematics. Students who have engaged in prior graduate study may be eligible for transfer credit for courses directly related to the student's field.

Each student in the program must pass a preliminary examination in the major field of specialization, which is generally taken by the end of the fifth semester. Students may also be required to pass a written preliminary examination in quantitative tools or a basic discipline, usually by the end of the third semester (this requirement varies by area). Students are encouraged to become active in the research process as early as possible, and are required to submit a research paper before the end of the third semester. Students typically complete the Ph.D. qualifying examination, involving the presentation of a dissertation proposal, by the end of the sixth semester of full-time study. The student is expected to complete and defend the dissertation by the end of the eighth semester.

Applicants to the Ph.D. program must submit scores from the Graduate Record Examination (GRE) or the Graduate Management Admission Test (GMAT), transcripts for all prior work at the college or university level, and letters of recommendation from individuals who can speak to the applicant's ability to undertake doctoral-level study in an academic program focused on scholarly research. Admissions decisions are made based on the applicant's academic qualifications as well as on an assessment of the fit between a candidate's scholarly interests and those of the school's current research faculty.

Accounting

311. Introduction to Accounting I. Studies the basic concepts and limitations of financial accounting. Covers the financial reporting process, and the development, interpretation, and analysis of financial statements for external users, such as investors and creditors. No credit for Ph.D. students in Management. [2] Chaney.

312. Introduction to Accounting: Financial Reporting and Control. Accounting addresses the measurement, aggregation, and evaluation of economic information useful for decision making. This information is frequently consolidated, organized, and presented in the form of financial reports. Regarding these financial reports, FASB Concept Statement Number 1

states (paragraph 9), "Financial reporting is not an end in itself but is intended to provide information that is useful in making business and economic decisions —for making reasoned choices among alternative uses of scarce resources in the conduct of business and economic activities." We will focus on internally available information, which is not required for disclosure in the external financial statements. Analysis of such proprietary, internal information, the product of firms' managerial accounting systems, will be our focus in this course. Users of these internal information sources are managers, directors, investment bankers, consultants, internal and external auditors, and others. This course is divided into two parts. First, we will examine firms' managerial accounting systems and their use in decision making. Second, we will examine these accounting systems and their use in planning, control, and performance evaluation. We begin the course with a discussion of the basic vocabulary and mechanics of managerial accounting systems. For the remainder of the course, we will focus on how to identify and extract relevant information from managerial accounting systems as an input to decision making and performance evaluation. Throughout, we consider the limitations of, and assumptions underlying, these data. The course objectives are reinforced through the lecture notes and course packet readings, assigned case write-ups, class and group discussions and problem solving, and exams. There is a required course packet containing lecture notes and cases. There is a supplementary optional text for those desiring additional reading. No credit for Ph.D. students in Management. [2] Willis.

411. Financial Accounting. Objectives are to gain a knowledge of the functions, limitations, and challenges of financial accounting and to develop the capability to evaluate critically and understand financial accounting theory and practice. Includes the study of financial accounting theory, the formulation of accounting principles, and the structure of generally accepted accounting principles. Prerequisite: 311. [4] Jeter.

511. Advanced Financial Reporting and Analysis. Studies advanced topics in financial accounting. Emphasis is on accounting for business combinations, including purchase and pooling of interests, consolidated financial statements, cash flows, translation of foreign financial statements, and other selected issues. Prerequisite: 411. [2] Hackenbrack, Thorne Jenkins.

513. Financial Statement Analysis. Accounting addresses the measurement, aggregation, and evaluation of economic information useful for decision making. In Financial Statement Analysis, we will focus on a subset of this construct, which is labeled general purpose external financial accounting and reporting. General purpose statements are those provided to individuals who do not have the authority to compel management to provide information they desire. These individuals differ from taxing authorities or others who have specialized needs, but also the authority to compel enterprises to furnish the information they desire. General purpose statements are those viewed as suitable for investors, creditors, and other resource providers. External statements are those available to individuals outside of the firm. Managers, directors, and others may have access to additional internal (and often proprietary) information. This course provides a broad framework for using financial statements and other SEC-required regulatory disclosures in business analyses. Emphasis is placed on developing a critical, general manager's perspective for interpreting required financial disclosures, understanding the types of financial information available in the public domain and their purposes, developing an appreciation of (some of) the inherent ethical conflicts that may color managers' and sell-side analysts' disclosures, and formulating an approach to evaluating an enterprise's overall financial reporting and the implications of that analyses from the perspective of a potential shareholder or creditor. The course objectives are reinforced through the course reading materials, assigned problems, in-class problem solving, and class discussions. This course is useful for individuals planning careers in investment banking, portfolio management, corporate finance, management consulting, and security analysis. Prerequisite or corequisite: 411. [2] Willis.

519. Special Topics: Accounting and Financial Communication. Prerequisite: 311, consent of instructor. Thorne Jenkins.

539f. Special Topics in Finance: Federal Income Taxation of Mergers and Acquisitions. This course is designed primarily for the student who wants a general understanding of the basic principles and concepts of federal income taxation that apply to corporate mergers, acquisitions, and LBOs. Topics include taxable and tax-free stock and asset acquisitions; incorporation transactions; non-acquisitive reorganizations; current and liquidating distributions to shareholders; stock redemptions; and survival of net operating losses and other tax attributes. Prerequisite: 311, 331. [2] Henderson.

612. Research Seminar in Accounting. Prerequisite: consent of instructor.

615. Independent Study in Accounting. Prerequisite: consent of instructor.

Economics

321. Business in the World Economy. Addresses the impact of national and global economic developments on the business environment. The determinants of national income, inflation, interest rates, unemployment rates, business cycles, exchange rates, and foreign investment are discussed, with particular attention to the increasingly important linkages between the U.S. and global economies. The course also examines the effects of U.S. and foreign government policies with respect to taxation, public expenditures, money supply, capital markets, and foreign trade and investment on the economic environment of business. [2] Parsley.

322. Managerial Economics. Studies the behavior of consumers and firms in a market economy. Topics include bilateral bargaining, auctions, supply and demand, costs, competition, monopoly, oligopoly, the organization of firms and markets, and strategy. [2] Froeb.

425. Game Theory and Business Strategy. Game theory is a discipline that offers a systematic way of analyzing problems of strategic behavior in interactive situations. This course develops basic concepts from game theory and applies them to business strategy. Some of the concepts to be considered include: 1) decision tree analysis; 2) looking forward and reasoning backward; 3) anticipating the moves of the rival; 4) inducing cooperation; 5) strategic use of commitments, threats, promises, and credibility; 6) pre-emptive moves and deterrence; and 7) creating and using one's reputation strategically. The strategic significance of these concepts will be demonstrated through business case studies. Prerequisite: 321. [2] Shor.

427. Economics of Organizations. Seeks to provide students with the knowledge and powerful thinking tools that will help them to understand the internal organization. Until recently, economics largely ignored the internal organization and operation of the firm. However, new developments in agency theory and game theory have made it possible to analyze the roles of information and incentives inside the firm. Prerequisite: 322. [2] Cohen.

Finance

331. Managerial Finance. An analysis of the basic problems in corporate financial management. The course is organized around the theme of asset valuation. Topics covered include stock and bond valuation, capital budgeting, cost of capital, market efficiency, and company valuation. No credit for Ph.D students in management. [2] Christie, Sagi.

431. Investments. Studies solutions to fundamental problems faced by individual and institutional investors. First, we cover a number of topics in fixed income markets including the different ways of computing bond yields, forecasts of interest rates using the yield curve, and

duration and convexity as measures of bond risk. Second, we solve the asset allocation problem to determine an optimal portfolio mix. We review the relevant theory, use an advanced spreadsheet to find an answer, and discuss issues faced by portfolio managers. Third, we use two methods to value options, the Black-Scholes formula and the binomial tree, and show how investors can use options to customize their risk-reward profile. Prerequisite: 331. [2] Bollen.

432a. Corporate Valuation. Focuses on corporate valuation. Topics covered include the use of financial statements in developing cash flow forecasts, estimating the cost of capital, financing policy, tax effects, investment options, and managing companies to add value. Applications include: capital budgeting, mergers and acquisitions, corporate restructuring. Prerequisite: 331. [2] Lewis, Ovtchinnikov.

432b. Corporate Financial Policy. Examines major financial decisions and policies of a corporation. The topics considered are dividend policy, security issuance and repurchase decisions, management compensation plans, optimal capital structure, uses of various financial instruments, bankruptcy and reorganization, security issuance and going private, dividend policy and repurchase decisions. Prerequisite: 432a. [2] Staff.

433a. International Financial Markets and Instruments. Studies the international monetary system, the foreign exchange market, and the determinants of exchange rates. Financial instruments for managing exchange risk are studied. Issues in hedging foreign exchange exposure and in financing the global firm are considered. Prerequisite: 431. [2] Stoll.

433b. International Corporate Finance. Unique problems of the financial manager operating internationally are considered. Topics covered include management of foreign exchange risk, multinational capital budgeting, foreign direct investment, risk management, international taxation, global capital raising, and international corporate governance. Prerequisite: 433a. [2] Staff.

435a. Equities Markets. Examines several issues related to investing in U.S. equities markets. Topics include market operations, regulatory issues, trading styles, and market efficiency. Prerequisite: 431. [2] Bollen.

435b. Bond Markets. Analysis of government, municipal, and corporate debt markets. Topics include term structure of interest rates, interest rate risk, duration and convexity and mortgage-backed securities. Prerequisite: 431. [2] Staff.

435c. Derivatives Markets. Includes the relation of futures and cash prices, hedging with futures, risk and return in futures, option trading strategies, put-call parity, and option valuation. Derivatives on commodities, stock indexes, and debt instruments will be analyzed. Prerequisite: 431. [2] Staff.

436. Financial Institutions. Focuses on the managerial issues in banking and other financial services firms. Examines the specialized contracts used in the financial services industry and the interplay between information, technology, taxation, and regulation in shaping the structure and markets for these contracts. Prerequisite: 431. [2] Staff.

524. Seminar in Monetary and Fiscal Policy. Focuses on current fiscal and monetary problems and policies related to the functioning of and the outlook for the economy in which business operates. The approach is pragmatic and institutional but also involves the basics of how our monetary system operates and the theoretical concepts as they apply to current problems and policies. Distinguished speakers, including top-level Federal Reserve and Treasury officials and leading representatives of private research and financial organizations, participate in seminar presentations and discussions. [2] Daane.

530. Mergers and Acquisitions. Covers some of the major corporate finance activities of investment banks including: mergers and acquisitions, takeovers and takeover defenses, as

well as private financing, asset restructuring, capital restructuring, leveraged buyouts, management buyouts, and leveraged recapitalizations. Familiarizes students with institutional details and presents a variety of case situations in which corporate valuation, industry and financial analysis, strategic decision making, and financial contracting and design are practiced. Casework represents an integral part of this course and is used to challenge students to structure their own analysis of how corporate finance can be used to create value for shareholders. Prerequisite: 432a. [2] Masulis.

531. Venture Capital. (Short Course between Mods 1 & 2) This course examines the financial, economic, and legal strategies that underlie private equity transactions in the United States and other countries. The course begins by examining how private equity firms raise money from institutional and individual investors and structure private equity funds. We will discuss the legal, financial, and economic motivation for the different types of private equity fund structures. The course then turns to how private equity funds select, invest in, and manage their portfolio companies. We will discuss how venture capital firms, a particular (and very important) type of private equity investor, provide capital to start-up firms, and how other private equity firms provide capital to help more established companies, both public and private, grow and restructure. One common theme that runs through this course is how financial instruments and legal contracts between the parties involved in private equity transactions address predictable conflicts of interest. The course will center on the study of cases that highlight important concepts and issues in private equity transactions using actual historical situations. Students are expected to do fundamental analysis of the companies and transactions presented in the cases as well as discuss how the legal environment at the time of the case affects their recommendations. Prerequisite: 432a. [1] Megginson.

532. Risk Management. Considers techniques for risk management of financial institutions. Topics include value at risk systems for managing risk, the application of portfolio theory to risk management, forecasting risk and correlations, regulatory approaches to risk control, and regulatory capital requirements. Prerequisite: 435b, 435c. [2] Ball.

534. Financial Data Analysis. Introduces students to the many databases used in empirical research in finance, including CRSP, Compustat, and TAQ (NYSE, Amex, and Nasdaq-NMS transaction data). The course will use the SAS System to access these databases and to analyze the data. Basic Fortran programming will also be presented to familiarize students with CRSP/Compustat access programs. Intended for Ph.D. students and M.B.A.'s who are interested in more analytically oriented finance positions. Prerequisite: 431. [2] Schenzler.

535a. Derivative Securities Valuation. Examines the pricing of derivative securities. Focuses on futures, options, and exotic securities. A number of valuation techniques are examined which include numerical approaches. Prerequisite: 435c. [2] Schlag.

536. Quantitative Portfolio Management. Takes the perspective of a quantitatively oriented equities portfolio manager. Examines portfolio theory, portfolio selection models, equilibrium asset pricing models such as the CAPM and the APT, earnings estimation, and the evaluation of portfolio performance. Designed for very quantitatively oriented students. Prerequisite: 431. [2] Cooper.

630a. Asset Pricing Theory. Rigorously develops the theoretical basis for major asset pricing models. Single period versions of the Capital Asset Pricing Model, the Arbitrage Pricing Model, and the Option Pricing Model are formally developed from basic economic principles. Prerequisite: consent of instructor. [2] Staff.

630b. Corporate Finance Theory. Uses state preference theory to develop single period theories of optimal investment and optimal capital structure. Explores models of adverse selection and moral hazard and uses them to evaluate management compensation, financing

decisions, and corporate ownership structure. Recent empirical evidence is reviewed and the techniques and evidence are critiqued. Prerequisite: consent of instructor. [2] Staff.

631a. Empirical Methods in Finance A. The first of two courses that examine the recent empirical developments in financial economics. Focuses on topics in financial markets such as market efficiency, market models, arbitrage pricing models, intertemporal equilibrium models, and market microstructure. Theoretical foundations are developed; empirical research evidence is considered; applications of models are stressed. Prerequisite: 630a, 630b. [2] Staff.

631b. Empirical Methods in Finance B. The second of two courses that examine the recent empirical developments in financial economics. Focuses on topics in corporate finance such as the securities issuance process, capital structure, corporate governance, and market response to corporate disclosures. Prerequisite: 630a, 630b; 631a. [2] Staff.

632. Advanced Finance Theory. Covers an advanced treatment of finance theory. Topics include utility theory, arbitrage and pricing, equilibrium models and complete markets, intertemporal models, continuous time finance, contingent claim pricing, and the term structure of interest rates. Prerequisite: 630a, 630b. [4] Staff.

635. Seminar in Behavioral Finance. This course searches for evidence of behavioral explanations for financial irregularities (anomalies) that are inconsistent with the efficient market hypothesis. Prerequisite: 331, 431, permission of instructor. [2] Staff.

636. Research Seminar in Finance. Prerequisite: consent of instructor.

Information Technology

490. Enterprise Resource Planning. Enterprise Resource Planning (ERP) is the integration of information sources and flows across the various components of an enterprise. The purpose of ERP is to facilitate the seamless coordination of the organization's key activities, especially logistical and financial activities. The course will examine the components of ERP systems, how the integration is accomplished, and the functions of ERP software. [2] Blanning.

497. Internet Technology and Applications. Describes the structure and function of the Internet and its applications. Topics include the TCP/IP Protocol Suite, Internet strategies and business models, Internet security (public key infrastructure and firewalls), and recent developments (XML and the semantic Web). Students will learn to script Web pages using HTML, and to program in JavaScript, and to script Web pages using Dreamweaver. [2] Blanning.

Marketing

361. Marketing Management. Designed to introduce students to the basic marketing principles and concepts. Marketing is the business function that manages customer value. Successful organizations integrate the objectives and resources of the organization with the needs and opportunities in the marketplace to create customer value and (thereby) create value for the firm. Effective implementation of the marketing concepts requires knowledge of key relationships between internal (company) and external (competitors and customers) environments, and how they are influenced by the marketing mix (product management, pricing, distribution channels, and promotion strategy). Students are challenged to apply the principles learned in class to current, "real world" marketing situations. [2] Hoeffler.

460. Marketing Communications: Advertising. This course covers the overall communications strategy with prime emphasis on the role of advertising and theories of how advertising works. Typical topics covered include targeting, creative strategy, media strategy,

budgeting, setting communications objectives, and advertising agency management. Complements MGT 464, Sales Promotion. Readings, cases, written case reports, and advertising lab assignments. Prerequisite: 361. [2] Escalas.

461a. Qualitative Marketing Research. This course is designed to provide an overview of qualitative marketing research and its use in making effective marketing decisions. Because MBA students are not typically training for careers in market research, the course emphasizes two things that are very relevant for a marketing manager: 1) how to evaluate the design of research studies to assess whether the results are valid and meaningful, and 2) how to analyze and interpret market research data for marketing decision making. Toward this end, we will examine a variety of qualitative research techniques including: focus groups; observation; in-depth interviews, ZMET; and projective techniques. This course will provide students with a “hands-on” experience with qualitative marketing research techniques through case discussions and assignments that include conducting research for an actual marketing problem faced by a real-world client. Corequisite: 361. [2] Escalas.

461b. Survey Design and Analysis. This course is designed to provide an overview of survey research and its use in making effective marketing decisions. Because MBA students are not typically training for careers in market research, the course emphasizes the analysis and interpretation of market research data for marketing decision making, and the design of research studies so that the results are both meaningful and valid. The course focuses on descriptive research, primarily survey research, as well as touching briefly on causal research (e.g., experimentation and test marketing). The course will apply many of the statistical techniques learned thus far in the Owen MBA program, such as t-tests, ANOVA, regression, and correlation. Additionally, we will discuss data reduction (e.g., factor analysis), scale reliability (e.g., Cronbach alpha), and more advanced marketing data analysis techniques, such as conjoint analysis, perceptual mapping, and cluster analysis. [2] Escalas.

461c. Marketing Models. Marketing decisions are primarily the purview of CEOs, CMOs, consultants, and marketing managers, but increasingly, marketing has permeated throughout companies such that all managers must consider their customers. Marketing decisions are optimal when they are fact-based, and marketing models are informed by both data and judgment. Models will be studied, created, and tested for all elements of marketing: clustering customers into segments, forecasting market sizes, customer relationship management database systems, diffusion rates for new products, advertising budgeting, pricing models, etc. Prerequisite: 461b. [2] Iacobucci.

462. Consumer Analysis. Consumer Analysis is the first of two sequentially linked Owen courses studying consumption behavior. The present course covers the decision-making phase of purchasing and the cultural and social factors that impinge on this decision. In MGT 562, Consumer Satisfaction/Dissatisfaction and Loyalty, the post-decision phase of consumption and its management (e.g., satisfaction, retention, and loyalty programs) will be studied with a greater focus on the critical value of retaining customers. At its basic premise, marketing is an attempt to influence consumers toward a purchasing act (and oftentimes a non-act). As such, this course seeks to provide insights into consumer pedagogies (e.g., psychology, sociology, social psychology) used in developing effective marketing strategies. In addition to learning how a deeper appreciation of consumer behavior analysis can inform the design of effective marketing, you will also gain a better understanding of yourself as a participant in marketing influence. Prerequisite: 361. [2] R. L. Oliver.

467. Developing and Marketing New Products. The new product development process is examined from idea to launch: covering elements such as idea screening and market scoping, to product development and market testing. Multiple techniques will be applied, including concept testing, conjoint analysis, for forecasting, new product diffusion structures and rates, etc. Prerequisite: 361. [2] Iacobucci.

468. Brand Management. The purpose of this class is to rigorously examine the process of branding and brand building. The class will begin with a review of the important traditional branding methods and ideas to provide a solid grounding on the marketing fundamentals of building strong brands. Drawing on scholarly research as well as current business practice, we will examine, analyze, and scrutinize the most important marketing issues facing firms today who wish to build strong brands. Prerequisite: 361. [2] Posavac.

560. Marketing Strategy. This advanced “lab” course allows students to apply many of the marketing lessons learned in previous courses and deeply extend marketing knowledge. The course is open to first-year and second-year students who want exposure to a wide variety of marketing tools in an applied setting. The course works as both a capstone course for second-year students and as an introduction to marketing strategy for first-year students, hopefully enhancing their learning in later marketing tools courses. Although there will be mini-lecture/discussion sessions each week, the primary aim is to have students learn by doing, and much of the learning will take place outside the formal classroom setting. The course is centered on a highly complex and realistic multi-period simulation game, Markstrat Online, which involves participants working in teams to make strategic marketing decisions. Markstrat Online is the latest version of the MARKSTRAT simulation. As part of a MARKSTRAT firm, students will devise plans, make decisions, and obtain results over approximately ten time periods. Hence, they will be faced with the realistic challenge of managing a team and efficiently learning from experience in a complex market—a market that evolves over time partly as a result of the actions taken by students and their competitors. Prerequisite: 361. [2] R. L. Oliver.

562. Customer Satisfaction and Loyalty. Consumer Satisfaction and Loyalty is the sequel to MGT 462, Consumer Analysis. The course addresses novel and unique approaches to understanding the degree to which customer product/service perceptions are fulfilled (i.e., satisfied). It then ties the satisfaction concept to the ultimate goal of loyalty and retention. By necessity, the course concentrates on the behavioral sciences and suggests strategy from the perspective of the consumer's mindset rather than from a product design or operations basis. Due to the diversity of product and service environments, the course is conceptually oriented and does not focus on any particular industry, per se. Topics include: determination of critical performance dimensions and their measurement; the roles and management of expectations and reactions to expectation-performance discrepancies (expectancy disconfirmation); post-purchase processes including complaint redress, retention, and loyalty—and the management of these processes, including fostering and maintaining loyalty programs; diagnostic satisfaction-related feelings including specific consumption affects (e.g., delight) and other emotions resulting from consumption, as well as the value to the firm of monitoring these sentiments. In addition, methodological techniques for measuring the various responses in consumption including expectations, performance perceptions, disconfirmation, emotions, satisfaction, and post-encounter behaviors are integral to the course and are discussed as each concept is introduced. Prerequisite: 460 or 462 or consent. [2] R. L. Oliver.

568. Pricing Strategies. Considers the theory and practice of setting prices. We will bring together economic frameworks and models of consumer behavior to analyze different pricing frameworks (e.g., value pricing, cost-plus) and tactics (segmentation, bundling). Pricing examples from various industries and legal aspects of pricing will also be discussed. Prerequisite: 361. [2] Shor.

662. Research Seminar in Marketing. Prerequisite: consent of instructor. Staff.

665. Independent Study in Marketing. Prerequisite: consent of instructor. Staff.

Operations

371. Operations Management. Overview of operations management in both service and manufacturing organizations with an emphasis on international operations. Topics include operations strategy, process analysis, quality control, queuing, enterprise planning systems, lean manufacturing, and supply chain management. No credit for Ph.D. students in management. [2] Kurtulus, Lapré.

471. Operations Planning and Control. Provides familiarity with state-of-the-art, computer-based production planning techniques. Topics include demand forecasting, aggregate planning and scheduling, material requirements planning, theory of constraints concepts, just-in-time systems and scheduling. Prerequisite: 371. [2] Dilts.

472. Supply Chain Management and Information. Introductory course on managing material and information flows throughout the supply chain, including aspects of product design and configuration, inventory planning, network configuration, and channel management. Topics include managing products with short life cycles, strategic alliances and information sharing, supplier development, and electronic supply hubs. Prerequisite: 371. [2] Kurtulus.

476. International Operations. Examines the importance of global manufacturing and service operations. How economics, currency fluctuations, politics, cultural traditions, and the infrastructures of the countries involved affect strategic and operational decisions such as facilities location and planning, materials sourcing, inventory control, process design, workforce management, and quality control. Compares operational hedging with financial hedging. Examines Mexican Maquiladora, Japanese, and European operations. Prerequisite: 371. [2] LeBlanc.

479. Management of Service Operations. The service sector has become the dominant sector in the global economy, yet productivity growth in the service sector has consistently lagged that of the manufacturing sector. Consequently, there is a big opportunity for service firms to better manage their operations. This introductory course on Service Operations covers design of service delivery systems, management of service capacity and demand, management of quality in services, and management of global service operations. The course will further your case analysis skills. Prerequisite: 371. [2] Lapré.

572. Strategic Management of Technology. This course focuses on the strategic management of technology and innovation in established firms. The conceptual framework of the course is an evolutionary process perspective on technology strategy and innovation. The fundamental ideas underlying this evolutionary perspective are 1) that a firm's technology strategy emerges from its technological competencies and capabilities, 2) that technology strategy is shaped by external (environmental) and internal (organizational) forces, and 3) that the enactment of technology strategy, through the experience it generates, serves to further develop the firm's technological competencies and capabilities. Cases, readings and lectures are utilized. Prerequisite: 371. [2] Dilts.

577. Managing and Improving Processes. This course is all about processes—the fundamental ways in which work gets done in organizations. The course equips students with concrete skills for analyzing, improving, and controlling office, administrative, service, and manufacturing processes. Specific topics include: defining and understanding processes, eliminating waste from processes, the improvement cycle and tools, six sigma, statistical process control, and implementation issues (i.e., change and project management). Prerequisite: 371. [2] Hyer.

672. Research Seminar in Operations. Prerequisite: consent of instructor. Staff.

675. Independent Study in Operations Management. Prerequisite: consent of instructor. Staff.

Organization Studies

440. Strategic Alignment of Human Capital. This course is designed to help managers and entrepreneurs improve business results by making better decisions about the management of human capital. Focus will be on mapping business models, identifying "pivot points" where human capital investments have the highest marginal value, and designing programs that align employees' skills and efforts with the achievement of organizational strategies. While students anticipating a career in human resource management and organizational development will benefit from this class, it is explicitly designed to give general managers the knowledge and skills they need to develop frameworks to diagnose problems, propose solutions, and make effective resource allocation decisions. Prerequisite: 342. [2] Gardner.

441. Organization Design. Examines traditional and innovative designs for organizational structures and processes within business organizations. Beyond understanding traditional organizational forms as static structures, we will also work to analyze the forces at work as organizations go through birth, growth, maturation, and decline phases. This course is recommended for any student who plans to work in a complex or dynamic organization, or who is interested in understanding and leveraging the relationship between organizational structure and business strategy. [2] Staff.

442. Talent Management. The study of the process by which firms project their human resource needs and the policies and practices they use to meet these needs. Firms must identify, acquire, develop, and allocate scarce and difficult-to-retain talent to ensure the achievement of business objectives. Topics include employment branding, lateral hiring, talent shortages, career paths, internal development, and managing nontraditional sources of labor. This class will allow current and future entrepreneurs, general managers, and human resource professionals to design and implement effective, cutting-edge talent management systems. Prerequisite: 342. [2] Gardner.

443. Power and Influence in Organizations. Explores issues of power, powerlessness, influence, conflict, and dissent within and between various types of organizations. Through readings, case studies, and discussions, we examine how power is gained, maintained, used, abused, and lost in the pursuit of interpersonal and organizational objectives. Also examines social issues at the intersection of business and society that may be analyzed in terms of power and influence, such as workplace rights, wealth distribution, and sexual and racial politics. [2] Barry.

444. Leadership: Theory and Practice. Focuses on leadership theory and its application to students' careers. Leadership concepts include traits, situations, communication, power, vision, integrity, emotional intelligence, and courage. Students develop a fundamental understanding of theory and research, and acquire skills and self insight to become effective leaders. [2] Daft.

445. Staffing. Examines organization staffing strategies. Topics include human resource planning, recruitment, job analysis, applicant assessment, equal employment opportunity, and affirmative action. Particular emphasis is given to the role of statistical analysis in designing and evaluating staffing systems. Practical exercises focus on strategically designing and evaluating staffing procedures. [2] Gardner.

446. Compensation Decision Making. Analysis of approaches to the motivation of human performance through reward systems, particularly compensation systems. Theoretical models from economics, psychology, and sociology are integrated in analyses of issues of wage structuring, the design of incentives, and wage level. Practical exercises in the design of compensation systems are employed. [2] Gardner.

447. Labor and Employee Relations. This course has two parts. The first half covers the basics of labor relations, including organizing, collective bargaining, and the grievance process. It also covers the decline of unions, and some of the issues that have developed as a result of that decline. The second half covers the broader area of "employee relations" including arbitration, mediation, employee layoffs, performance appraisal, managing diversity, implied contracts, and statutory rights. The course uses cases, but also is highly experiential, including simulations for grievance handling, arbitration, and performance appraisal. Labor and Employee Relations (LER) is useful for HR students, but also for Operations students (since many factories deal with the issues we cover in this class) and those who expect to be managing large groups of employees (including those who may become corporate managers, or expect to manage their own companies). For all students who are enrolled in the Human Capital Career Specialization, LER is a required course. [2] Friedman.

448. Negotiation. Designed to provide students from all functional backgrounds with skills needed to approach negotiations with confidence. This includes a framework for analysis, knowledge about one's own tendencies in negotiation, and a chance to experiment with negotiating techniques in various contexts. Topics include: integrative and distributive negotiations, individual differences in bargaining styles, coalitions, team negotiations, negotiating through agents, and ethical issues in negotiation. The course uses readings and cases, with considerable emphasis placed on negotiation simulations. [2] Barry, Lingo, Vogus.

455. The Law and Business of Climate Change. This course will use corporate responses to climate change to examine the legal, economic, and social influences on firm environmental behavior. Environmental regulations impose more than \$100 billion in costs per year on the economy. In addition, much private regulation of firm environmental behavior occurs in the shadow of public environmental laws. Firms are voluntarily reducing greenhouse gas emissions as well as other forms of pollution beyond what is currently required under the law. The course will draw on theoretical and empirical literature to explore the incentives for firms to comply with environmental laws, to participate in voluntary programs, to adopt environmental management systems, and to address environmental issues in corporate transactions. The course will include lecture and class discussion, along with mock negotiations in small group settings. The final grade will be based on class participation and performance on a written examination. The course is designed for both Owen and Vanderbilt Law School students and will be taught jointly by Professors Mark Cohen and Michael Vandenbergh. There is no requirement that Owen students have taken Environmental Law or that law students have taken business courses. It is highly interdisciplinary, drawing upon fields such as law, business, and social psychology. There are no prerequisites. Full semester course. [4] Cohen, Vandenbergh.

456. Ethics in Business. Designed to familiarize students with ethical dilemmas and opportunities for moral leadership in business. Students will develop a deeper understanding of the kind of ethical dilemmas they may face in business. They will also develop their skills and confidence in taking moral leadership in their professional careers. Case studies, invited speakers, and readings are used to deepen understanding of the issues and provide practical examples. [2] Victor.

540. Leading Change. Examines all aspects of organizational change from the perspective of a change leader or consultant. Topics covered include personal change, how to lead change in organizations, models and frameworks for change, new methods for changing corporate culture and mindset, and approaches for implementing new organization design via strategy, reengineering, or structure. [2] Daft.

549e. Controversies/Debates in Business, Management, and Society. This course is a vehicle for analysis and debate on current, controversial issues related to business, management, economics, and society. Course objectives blend skills and substance. With respect to skills, there will be material on the nature of argument and analysis, with a goal of creating meaningful improvement in students' ability to develop and deploy goal-directed persuasive arguments. With respect to substance, an objective of the course is to expand students' in-depth knowledge of key issues of the day related to business, economics, and management practice. [2] Barry.

642. Research Seminar in Organization Studies. Full-semester doctoral seminar that covers a range of theory and empirical research associated with the study of individual behavior and social processes in organizations. Prerequisite: consent of instructor. Staff.

643a/b/c/d. Seminar in Organization Studies. Module-length (seven-week) doctoral seminar on selected topics associated with research in organizational behavior, organizational theory, and human resource management. Topics vary, as announced each year. Prerequisite: consent of instructor. Staff.

645. Independent Study in Organization Studies. Students work independently, under the direction of a faculty member, on topics of special interest not covered in course offerings. Prerequisite: consent of instructor. Staff.

Statistics

381. Managerial Statistics. Principles of statistical analysis and inference, including descriptive statistics, probability theory, statistical estimation, tests of hypotheses, analysis of variance, and regression and correlation analysis. [2] March.

480. Business Forecasting. Topics include smoothing methods, multiple regression, and ARIMA models. Prerequisite: 381. [2] Cool.

482. Managerial Statistics II. The emphasis is on important general forms of data analysis, basic exploratory methods, and multiple regression. Prerequisite: 381. Ball.

681. Stochastic Processes. Emphasizes the role of stochastic modeling in finance and economics. Topics include random walks, Brownian motion, Wiener processes, Poisson processes, Markov chains, diffusion processes, martingales, and Ito stochastic calculus. Applications to security pricing. Prerequisite: consent of instructor. [2] Ball.

682. Research Seminar in Quantitative Analysis. Prerequisite: consent of instructor. Staff.

685. Independent Study in Quantitative Analysis. Prerequisite: consent of instructor. Staff.

Materials Science and Engineering

See Interdisciplinary Materials Science

Mathematics

CHAIR Dietmar Bisch (On leave 2008/2009)

ACTING CHAIR Constantine Tsinakis

VICE CHAIR Philip S. Crooke III

DIRECTOR OF UNDERGRADUATE STUDIES Mark N. Ellingham

DIRECTOR OF GRADUATE STUDIES Douglas P. Hardin

DIRECTOR OF TEACHING Jo Ann W. Staples

PROFESSORS EMERITI Richard F. Arenstorff, Billy F. Bryant, Richard R. Goldberg,

Matthew Gould, Robert L. Hemminger, Ettore F. Infante, Bjarni Jónsson,

Charles S. Kahane, Richard J. Larsen, Charles K. Megibben, Michael D. Plummer,

James R. Wesson, Horace E. Williams

PROFESSORS John F. Ahner, Akram Aldroubi, Dietmar Bisch, Alain Connes,

Philip S. Crooke III, Emmanuele DiBenedetto, Paul H. Edelman, Mark N. Ellingham,

Yanqin Fan, Douglas P. Hardin, C. Bruce Hughes, Gennadi Kasparov,

Ralph N. McKenzie, Michael L. Mihalik, Marian Neamtu, Alexander Ol'shanskiy,

John G. Ratcliffe, Edward B. Saff, Mark V. Sapir, Larry L. Schumaker, Gieri Simonett,

Constantine Tsinakis, Glenn F. Webb, Daoxing Xia, Guoliang Yu, Dechao Zheng

ASSOCIATE PROFESSORS Denis Osin, Eric Schechter, Steven T. Tschantz

ASSISTANT PROFESSORS Simon Foucart, Shamindra Ghosh, Pinhas Grossman,

Basak Gürel, Qayum Khan, Matjaz Konvalinka, George Metcalfe, Mikhail Perepelitsa,

Jesse Peterson, Alexander Powell, Joanna Pressley, Mrinal Raghupathi, Daniel Ramras,

Romain Tessera, Ju-Yi Yen, Kourosh Zarringhalam, Qi Zhong

SENIOR LECTURERS Derek Bruff, Linda Hutchison, Pamela Pigg, John Rafter, Lori Rafter,

Jo Ann W. Staples

DEGREES OFFERED: *Master of Arts, Master of Science, Doctor of Philosophy*

✂ A MASTER'S degree may be earned by (a) completing 24 hours of course work and a thesis or by (b) completing 36 hours of course work. It may also be awarded (c) on admission to candidacy for the Ph.D. degree. Program (b) is strongly recommended for students who plan to terminate their graduate work with a master's degree; with the department's approval, however, a student may pursue a terminal master's degree under program (a).

By careful selection of courses, a master's candidate may achieve special preparation in applied mathematics or computer science and thus become qualified for a position in industry or government or as a teacher in high school or junior college. Each of the master's programs is adequate preparation for advanced graduate work in mathematics.

Candidates for the Ph.D. degree take at least 48 hours of formal course work, including seven courses from 272a–272b, 283a–283b, 330a–330b, and 331a–331b, and at least eight additional courses at the 300 level. All Ph.D. candidates are required to demonstrate a reading knowledge in one of the following languages: French, German, Russian. A complete description of Ph.D. requirements in mathematics may be obtained on request from the director of graduate studies.

Courses acceptable for credit toward an advanced degree in mathematics are those listed below that are numbered 247, 248, or 270 or above, unless

exception has been granted. Courses numbered below 270 may be used for minor credit by students in other disciplines. All graduate students participate in teaching activities. This requirement may be waived in the case of students with previous teaching experience.

200. Intensive Problem Solving and Exposition. Intended to develop widely applicable mathematical skills. Focus on use of basic principles such as induction, the pigeonhole principle, symmetry, parity, and generating functions. Prerequisite: one year of calculus and consent of instructor. [3] (Not currently offered)

204. Linear Algebra. Algebra of matrices, real and complex vector spaces, linear transformations, systems of linear equations. Eigenvalues, eigenvectors, Cayley-Hamilton theorem, inner product spaces, orthogonal bases. Hermitian matrices. Designed primarily for mathematics majors. No credit for students who have completed 194 or 205a. Corequisite: 170b or 175. Credit will not be given for both 204 and 194 or 205a–205b. FALL, SPRING. [3] Staff.

208. Ordinary Differential Equations. First- and second-order differential equations, applications, linear differential equations, series solutions, boundary-value problems, existence and uniqueness theorems. Intended for mathematics and advanced science majors. Prerequisite: multivariable calculus and linear algebra. Credit is not given for both 208 and 196. FALL, SPRING. [3] Staff.

210. Axiomatic Geometry. Hilbert's axioms, neutral geometry, Euclidean geometry, independence of the Parallel Postulate, non-Euclidean geometry. The theory developed axiomatically. Emphasis on rigorous mathematical proofs. Prerequisite: multivariable calculus. [3] (Not currently offered)

215. Discrete Mathematics. Elementary combinatorics including permutations and combinations, the principle of inclusion and exclusion, and recurrence relations. Graph theory including Eulerian and Hamiltonian graphs, trees, planarity, coloring, connectivity, network flows, some algorithms and their complexity. Selected topics from computer science and operations research. Prerequisite: linear algebra. FALL. [3] Staff.

216. Probability and Statistics for Engineering. Discrete and continuous probability functions, cumulative distributions. Normal distribution. Poisson distribution and Poisson process. Conditional probability and Bayes' formula. Point estimation and interval estimation. Hypothesis testing. Covariance and correlation. Linear regression theory and the principle of least squares. Monte Carlo methods. Intended for students in Electrical Engineering and Computer Engineering. Credit is not given for both 216 and 218. SPRING. [3] Staff.

218. Introduction to Mathematical Statistics. A survey of probability and applied and mathematical statistics. Discrete and continuous probability models, mathematical expectation, laws of large numbers, point estimation, confidence intervals, hypothesis testing, non-parametric techniques, applications. Students taking 218 are strongly urged to take 218L concurrently. Prerequisite: 155b or 170a or consent of instructor. FALL, SPRING. [3] Yen.

218L. Statistics Laboratory. Applications of the theory developed in 218. Emphasis on data analysis and interpretation. Topics covered include the one- and two-sample problems, paired data, correlation and regression, chi-square, model building. Examples are drawn from many disciplines. Corequisite: 218 or equivalent. FALL, SPRING. [1] Yen.

219. Introduction to Applied Statistics. A brief review of basic applied statistics followed by a development of the analysis of variance as a technique for interpreting experimental data. The generalized likelihood ratio principle, completely randomized designs, nested designs, orthogonal contrasts, multiple comparisons, randomized block designs, Latin

squares, factorial designs, 2^n designs, fractional factorials, confounding, introduction to response surface methodology. Applications will be emphasized. Prerequisite: 218 or equivalent. SPRING. [3] Staff.

221. Theory of Numbers. The Euclidean algorithm, Euler's phi function, simple continued fractions, congruences, Fermat's theorem, Wilson's theorem, and elementary Diophantine equations. FALL, SPRING. [3] Ratcliffe.

223. Abstract Algebra. Fundamental properties of integers and polynomials. Elementary properties of groups, rings, integral domains, fields, and lattices. Prerequisite: linear algebra. FALL, SPRING. [3] Tsinakis, Ol'Shanskiy.

226. Introduction to Numerical Mathematics. Numerical solution of linear and nonlinear equations, interpolation and polynomial approximation, non-numerical differentiation and integration, least-squares curve fitting and approximation theory, numerical solution of differential equations, errors and floating point arithmetic. Application of the theory to problems in science, engineering, and economics. Student use of the computer is emphasized. Prerequisite: Computer programming and linear algebra, differential equations. FALL. [3] Webb.

229. Advanced Engineering Mathematics. Vector analysis including directional derivatives, transformation of coordinates, divergence and curl. Line integrals, surface integrals, divergence theorem. Stokes' theorem. Functions of a complex variable, including limits, derivatives, Cauchy-Riemann equations, exponential, trigonometric, hyperbolic, and logarithmic functions. Complex integrals, Cauchy's integral theorem and formula. Taylor and Laurent series. Calculus of residues. Prerequisite: ordinary differential equations. SPRING. [3] Ahner.

234. Methods for Initial and Boundary-Value Problems. Construction of the solutions to initial- and boundary-value problems for partial differential equations using separation of variables in conjunction with Fourier series and integrals. Emphasis on obtaining explicit formulas for the solutions of various problems involving the heat equation, the wave equation, and Laplace's equation. Prerequisite: elementary differential equations. Recommended: linear algebra. [3] (Not currently offered)

240. Transformation Geometry. Transformations of the plane, groups of transformations, reflections, glide reflections, classification of the isometries of the plane, frieze groups, analysis of frieze patterns, wall paper groups, and analysis of wall paper patterns. Especially recommended for prospective teachers of mathematics. Prerequisite: linear algebra. FALL. [3] Ratcliffe.

242. Topology of Surfaces. Fundamental concepts of topology, including properties of continuity, compactness, and connectivity. Topology of surfaces, triangulations, and the fundamental group. Introduction to basic ideas of graph theory, vector fields, and Euclidean and hyperbolic geometry. SPRING. [3] Staff.

246a. Introduction to Actuarial Mathematics. Applications of calculus and probability to actuarial science. The mathematical foundations of financial mathematics, including the theory of interest and multivariate probability distributions. Prerequisite: multivariable calculus. Co-requisite: 216, 218, or 247. FALL. [3] J. Rafter.

246b. Actuarial Models. Probabilistic analysis of insurance. Single-life models, including time-value of benefits, life annuities, premiums, and benefit reserves: Multiple-decrement models; Multiple-life models. Probabilistic topics: Markov chains and Poisson processes. Prerequisite: 216, 218, or 247; and 246a. SPRING. [3] J. Rafter.

247. Probability. Combinatorics, probability models (binomial, Poisson, normal, gamma, etc.). Stochastic independence, generating functions, limit theorems and types of convergence,

bivariate distributions, transformations of variables. Markov processes, applications. Prerequisite: multivariable calculus and linear algebra. Except for students with extremely strong backgrounds, 218 should be taken prior to 247. FALL. [3] Grossman.

248. Mathematical Statistics. Distribution theory, order statistics, theory of point estimation and hypothesis testing, normal univariate inference, Bayesian methods, sequential procedures, regression, non-parametric methods. Students interested in applications may take 218L. Prerequisite: 247. SPRING. [3] Neamtu.

250. Introduction to Mathematical Logic. Development of the first order predicate calculus and fundamental metamathematical notions. FALL, SPRING. [3] Schechter.

251. Analytic Number Theory. Arithmetical functions, distribution of prime numbers, Dirichlet's theorem on primes in arithmetic progressions, Dirichlet series, and Euler products. Prerequisite: 221. [3] (Not currently offered)

252. History of Mathematics. The major developments of mathematics from ancient times to the early twentieth century. Emphasis both on historical perspective and on the mathematics; assignments include many exercises and theorems. Prerequisite: multivariable calculus, and either linear algebra or 223. Especially recommended for teacher candidates. FALL. [3] L. Rafter.

253. Error-Correcting Codes and Cryptography. Applications of algebras to reliability and secrecy of information transmission. Error-correcting codes, including linear, Hamming, and cyclic codes, and possibility BCH or Reed-Solomon codes. Cryptography, including symmetric-key, DES, and RSA encryption. Prerequisite: linear algebra. FALL. [3] Ellingham.

256. Mathematical Modeling in Economics. Modeling microeconomic problems of supply and demand, profit maximization, and Nash equilibrium pricing. Auctions and bargaining models. Statistical models and data analysis. Computational experiments. Prerequisite: multivariable calculus. SPRING. [3] Tschantz.

259. Advanced Calculus. Properties of real numbers, limits, sequences and series, uniform convergence, and power series. Basic properties of functions on the real line, and the elementary theory of differentiation and integration. Emphasis on methods of proof used in upper-division mathematics courses. Prerequisite: multivariable calculus. FALL. [3] Ahner.

260. Introduction to Analysis. Elementary topological concepts including compactness and completeness. Functions of several variables, continuity, differentiability, the Riemannian integral, and function spaces; inverse function and implicit function theorems. Prerequisite: multivariable calculus. SPRING. [3] Foucart.

261. Complex Variables. Study of complex numbers, analytic and elementary functions, transformations of regions, properties of power series, including Taylor's and Laurent's. The calculus of residues with applications, conformal mapping with emphasis upon boundary value applications. Prerequisite: 196 or 198 or 208. SPRING. [3] Powell.

262. Mathematical Modeling in Biology. Mathematical modeling with applications in biology and medicine. Basic mathematical modeling tools such as linear regression, differential equations, matrix and statistical analysis, probability theory, and computer simulation. Mathematical models in population dynamics, epidemiology, immunology, diffusion phenomena, pharmacokinetics, neurophysiology, and biochemistry of cells. Prerequisite: linear algebra and differential equations. SPRING. [3] Staff.

270. Differential Geometry. Curvature, torsion, vector fields, and the Frenet formulas for curves in \mathbb{R}^3 . Review of continuity and differentiation in \mathbb{R}^n , Stokes' theorem and applications, fundamental forms and the shape operator, geodesics, and Gaussian curvatures for

surfaces in \mathbb{R}^3 . The Euler characteristic and the Gauss-Bonnet Theorem. Prerequisite: 260. SPRING. [3] Yu.

272a–272b. Topology. 272a: Connectedness, compactness, countability, and separation axioms. Complete metric spaces. Function spaces. 272b: The fundamental group and covering spaces. Topology of surfaces. Simplicial complexes and homology theory. Homotopy theory. Prerequisite: 242. [3–3] Mihalik.

274. Combinatorics. Elements of enumerative analysis including permutations, combinations, generating functions, recurrence relations, the principle of inclusion and exclusion, and Polya's theorem. Some special topics will be treated as class interest and background indicate (e.g., Galois fields, theory of codes, and block designs). SPRING. [3] Staff.

275. Graph Theory. The mathematical theory of networks. Traversing graphs using paths, cycles, and trails. Matchings and other graph factors. Coloring of vertices and edges. Connectivity and its relation to paths and flows. Embeddings of graphs of surfaces, especially the plane. Prerequisite: linear algebra. FALL. [3] Edelman.

280. Set Theory. The basic operations on sets. Cardinal and ordinal numbers. The axiom of choice. Zorn's lemma, and the well-ordering principle. Introduction to the topology of metric spaces, including the concepts of continuity, compactness, connectivity, completeness, and separability. Product spaces. Applications to Euclidean spaces. Strongly recommended for beginning graduate students and for undergraduates who plan to do graduate work in mathematics. Prerequisite: intermediate calculus and linear algebra. [3] (Not currently offered)

283a–283b. Modern Algebra. 283a: group theory through Sylow theorems and fundamental theorem of finitely generated abelian groups. 283b: introductory theory of commutative rings and fields, and additional topics such as Galois theory, modules over a principal ideal domain and finite dimensional algebras. Prerequisite: linear algebra. An elementary course in modern algebra (e.g., 223) is strongly recommended. [3–3] Tsinakis.

284. Lattice Theory and the Theory of Ordered Sets. An introduction to basic concepts and theorems in lattice theory and the theory of ordered sets, with connections to universal algebra and computer science. Boolean algebras, modular and distributive lattices, ordered topological spaces, algebraic lattices and domains, fixed point theorems, cosets, free lattices. Prerequisite: 223 or equivalent. [3] (Not currently offered)

286. Numerical Analysis. Finite difference and variational methods for elliptic boundary value problems, finite difference methods for parabolic and hyperbolic partial differential equations, and the matrix eigenvalue problem. Student use of the computer is emphasized. Prerequisite: 226 or consent of instructor. SPRING. [3] Schumaker.

287. Nonlinear Optimization. An introduction to modeling, theory and methods for nonlinear optimization problems. Modeling of application problems in science and engineering. Methods of unconstrained optimization with one and several variables. Theory of constrained optimization, including Karush-Kuhn-Tucker conditions. Penalty functions and other methods of constrained optimization. Computer tools such as a subroutine library or symbolic algebra system. Prerequisite: multivariable calculus, linear algebra, and computer programming. SPRING. [3] Ellingham.

288. Linear Optimization. An introduction to linear programming and its applications. Formulation of linear programs. The simplex method, duality, complementary slackness, dual simplex method and sensitivity analysis. The ellipsoid method. Interior point methods. Possible additional topics include the primal-dual algorithm, cutting planes, or branch-and-bound. Applications to networks, management, engineering, and physical sciences. Prerequisite: linear algebra and computer programming. FALL. [3] Staff.

292. Methods of Mathematical Physics. Linear operators on vector spaces, matrix theory, and Hilbert spaces. Functions of a complex variable and calculus of residues. Ordinary and partial differential equations of mathematical physics, boundary value problems, special functions. Prerequisite: ordinary differential equations and linear algebra. [3] (Not currently offered)

294. Partial Differential Equations. Classification of equations: equations of elliptic, parabolic, and hyperbolic type. Separation of variables, orthonormal series, solutions of homogeneous and nonhomogeneous boundary value problems in one-, two-, and three-dimensional space. Possible additional topics include subharmonic functions and the Perron existence theorem for the Laplace equation of Sturm-Liouville theory. Prerequisite: 198 or 208. FALL. [3] (Not currently offered)

297. Selected Topics. Topics of special interest, as announced in the *Schedule of Courses*. [Variable credit: 1–3 each semester, not to exceed 12] (Not currently offered)

298. Independent Study. Reading and independent study at a level considered introductory to graduate students or in an area of study not currently offered in 270–299 level range. FALL, SPRING. [Variable credit: 1–3]

309. Professional Development. The nature, history, and philosophy of mathematics; examination of various modern application areas; issues relating to being a professional mathematician such as ethics, teaching, and service; the use of Mathematica, TeX, the Web, and other resources with emphasis on techniques for communicating mathematics, both verbally and in writing. Prerequisite: one year of graduate study in the Department of Mathematics. [3] (Not currently offered)

310. Lie Groups and Lie Algebras. Continuous groups; classical groups; real and complex Lie algebras; applications to physics, geometry, and mechanics. Prerequisite: linear algebra, advanced calculus. [3] (Not currently offered)

312. Algebraic Topology. Homology, cohomology, homotopy theory. Prerequisite: 272a–272b. FALL. [3] Hughes.

323. Universal Algebra. Theory of general algebraic systems. Concepts discussed will include subalgebras, congruences, automorphism groups, direct and subdirect products, ultraproducts, free algebras, varieties and quasi-varieties, with applications to groups, rings, fields, lattices, Boolean algebras, semilattices, and semi-groups. Connections with model theory and category theory will be included as time permits. Prerequisite: 283a. Corequisite: 283b. FALL. [3] McKenzie.

324a–324b. Combinatorial and Geometric Group Theory. Generators and defining relations of groups; Cayley graphs and Van Kampen diagrams; subgroups and automorphisms of free groups; graphs of groups; fundamental groups of topological spaces; Magnus embedding; homology of groups; residual properties of groups; hyperbolic groups; small cancellation groups; 1-relator groups; algorithmic problems in groups. Prerequisite: 283a. [3–3] (Not currently offered)

325. Introduction to Approximation Theory. Best approximation in metric and normed vector spaces; Chebyshev approximation, Weierstrass-type theorems, rational approximation, orthogonal polynomials, trigonometric approximation, moduli of continuity, spline approximation; expansions and bases in function spaces. Prerequisite: 261, 330a. [3] (Not currently offered)

330a–330b. Theory of Functions of a Real Variable. The real number system, transfinite numbers, spaces, point sets in metric spaces, sequences and series of functions, measure. Lebesgue integration, convergence theory, inversion of derivatives. [3–3] DiBenedetto.

331a–331b. Theory of Functions of a Complex Variable. Complex integration, calculus of residues, harmonic functions, entire and meromorphic functions, conformal mapping, normal

families, analytic continuation, Riemann surfaces, analytic functions of several complex variables. [3–3] Saff.

333. Theory of Ordinary Differential Equations. Existence and uniqueness theorems, systems of linear differential equations, self-adjoint eigenvalue problems, asymptotic behavior, stability properties, perturbation theory, and applications. Prerequisite: 247 or equivalent and linear algebra, or consent of instructor. FALL. [3] Simonett.

334. Theory of Partial Differential Equations. Equations of the first order. Classification of equations of second order, existence and uniqueness, methods for solving elliptic, parabolic, and hyperbolic equations. Prerequisite: advanced calculus, differential equations, and linear algebra, or consent of instructor. [3] (Not currently offered)

355. Advanced Topics in Approximation Theory. Topics depend on the instructor but will typically include abstract approximation, classical approximation, multi-dimensional spline theory, and other advanced topics. Prerequisite: 330a. [3] (Not currently offered)

362a–362b. Functional Analysis. Function spaces, topological vector spaces, linear operators, conjugate spaces, Hilbert and Banach spaces, Banach algebras. Applications to function theory, differential equations, and integral equations. 362a, FALL; 362b, SPRING. [3–3] Zheng.

364a–364b. Nonlinear Differential Equations and Analytical Dynamics. 364a: classical dynamical systems. Lagrangian derivatives, canonical transformations, differential equations on the torus. Existence and continuation theorems, local and global questions. Equilibrium and periodic solutions, local integrals. Poincaré continuation method, characteristic exponents, stability, Liapunov theory. Integrable and Hamiltonian systems, perturbation theory, methods from functional analysis. 364b: surfaces of section, volume-preserving mappings, reduction to normal forms, fixed-point theorems, existence of integrals and convergence problems, Arnold-Moser theory on quasi-periodic motion and invariant tori. Abstract dynamical systems, ergodic properties, almost periodic motions, structural stability. Examples from celestial mechanics and other fields. [3–3] (Not currently offered)

366. Operator Algebras. Banach algebras. The Gelfand transform. C^* -algebras and von Neumann algebras. Positivity. States. The Gelfand-Naimark-Segal construction. $*$ -representations of C^* -algebras. Von Neumann's bicommutant theorem. Kaplansky's density theorem. Comparison theory of projections. Examples and applications. Prerequisite: 330b, 362a. [3] (Not currently offered)

367. Selected Advanced Topics. Topics of special interest at a level suitable for graduate students in mathematics, as announced in the *Schedule of Courses*. [Variable credit: 1–3] (Not currently offered)

368. Advanced Independent Study. Reading and independent study in an advanced area of mathematics under the supervision of an adviser. Requires approval of director of graduate studies. FALL, SPRING. [Variable credit: 1–3]

369. Master's Thesis Research.

372a–372b. Seminar in Topology. Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester] Yu, Mihalik.

375a–375b Seminar in Graph Theory. Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester]

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

381a–381b. Seminar in Number Theory. Recent topics. Depending on variation of topics, this course may be repeated. [Variable credit: 1–3 each semester] (Not currently offered)

- 383a–383b. Seminar in Algebra.** Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester] Sapir, Ol'Shanskiy.
- 385a–385b. Seminar in Approximation Theory.** Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester]
- 386a–386b. Seminar in Computational Mathematics.** Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1-3 each semester] Schumaker.
- 390a–390b. Seminar in Analysis.** Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester]
- 394a–394b. Seminar in Applied Analysis.** Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester] Hardin, Aldroubi.
- 395a–395b. Seminar in Mathematical Biology.** Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester] Staff.
- 398. Directed Study.** A reading course designed to give graduate students more background. FALL, SPRING. [Variable credit: 1–3 each semester] Staff.
- 399. Ph.D. Dissertation Research.**

Mechanical Engineering

CHAIR Robert W. Pitz

DIRECTOR OF GRADUATE STUDIES Nilanjan Sarkar

PROFESSORS EMERITI Thomas A. Cruse, John H. Dunlap, William F. Flanagan,
George T. Hahn, Donald L. Kinser, Barry D. Lichter, Robert L. Lott Jr., Arthur M. Mellor,
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RESEARCH PROFESSORS EMERITI J. Leith Potter, Robert A. Weeks

ADJOINT PROFESSOR Andrew A. Wereszczak

ASSOCIATE PROFESSORS Nilanjan Sarkar, Greg Walker

ASSOCIATE PROFESSOR OF THE PRACTICE Robert J. Barnett

ADJOINT ASSOCIATE PROFESSOR Joseph A. Wehrmeyer

ASSISTANT PROFESSORS Eric J. Barth, Deyu Li, Haoxiang Luo, Robert J. Webster III

DEGREES OFFERED: *Master of Science, Doctor of Philosophy*

✦ THE program in mechanical engineering allows concentration in a variety of areas of mechanical engineering research. Candidates for the Master of Science degree must complete 24 hours of course work and an acceptable master's thesis. The course work must include at least 12 hours at or above the 300 level, and a minor of at least 6 hours in courses separate from, but related to, the field of study. The Ph.D. program requires 36 hours of course work beyond the bachelor's degree (with a minimum of 24 hours completed at Vanderbilt) and an acceptable dissertation. This course work must

include a 6-hour minor in an area separate from, but related to, the field of study. At least 18 hours of the 36 must be at or above the 300 level. A maximum of 6 hours in independent study may be included in the 36-hour requirement. The Master of Engineering, an advanced professional degree, is offered by the School of Engineering. There is also a Master of Science/Doctor of Medicine degree program joint between the Department of Mechanical Engineering and the School of Medicine. Details may be obtained from the director of graduate studies in Mechanical Engineering.

251. Modern Manufacturing Processes. Introduction to manufacturing science and processes. A quantitative approach dealing with metals, ceramics, polymers, composites, and nanofabrication and microfabrication technologies. SPRING. [3]

259. Engineering Vibrations. Theory of vibrating systems and application to problems related to mechanical design. Topics include single degree of freedom systems subject to free, forced, and transient vibrations; systems with several degrees of freedom, methods of vibration suppression and isolation, and critical speed phenomena. Prerequisite: 190, Math 198. SPRING. [3]

260. Energy Conversion I. Energy resources, use, and conservation are studied. The fundamentals of positive displacement machinery, turbo-machinery, and reactive mixture are introduced and used to examine various forms of power-producing systems. Prerequisite: 220b, 224. FALL. [3]

261. Basic Airplane Aerodynamics. Includes aerodynamic forces, airfoil characteristics from both theory and experiment, aircraft experiment, aircraft performance, longitudinal and lateral stability and control. Prerequisite: 224. FALL. [3]

262. Environmental Control. A study of heating and cooling systems, energy conservation techniques, use of solar energy and heat pumps. Prerequisite: 220b; corequisite: 248. SPRING. [3]

263. Intermediate Fluid Mechanics. Mathematical and computational modeling of incompressible viscous fluid flows. Tensor notation; derivation of the Navier–Stokes equations; exact solutions; numerical and computational techniques; turbulence modeling. Prerequisite: 224. FALL. [3]

264. Internal-Combustion Engines. A study of the thermodynamics of spark ignition and compression ignition engines; gas turbines and jet propulsion. Prerequisite: 220b. SPRING. [3]

265. Direct Energy Conversion. The principles and devices involved in converting other forms of energy to electrical energy. Conversion devices: electro-mechanical, thermoelectric, thermionic, fluid dynamic, and fuel cell. Students who have earned credit for EECE 269 may not receive credit for ME 265. Prerequisite: 220a. SPRING. [3]

267. Aerospace Propulsion. Application of classical mechanics and thermodynamics principles to the study of rocket and aircraft propulsion. Design and performance analysis of air-breathing and chemical rocket engines. Advanced propulsion systems for interplanetary travel. Prerequisite: 220b, 224. SPRING. [3]

271. Introduction to Robotics. (Also listed as Electrical Engineering 271) History and application of robots. Robot configurations including mobile robots. Spatial descriptions and transformations of objects in three-dimensional space. Forward and inverse manipulator kinematics. Task and trajectory planning, simulation and of-line programming. Prerequisite: 190, Math 194. FALL. [3]

275. Introduction to Finite Element Analysis. Development and solution of finite element equations for solid mechanics and heat transfer problems. Introduction to commercial finite element and pre- and post-processing software. Two lectures and one three-hour laboratory each week. Prerequisite: CE 182, Math 198. SPRING. [3]

280. Advanced Dynamics of Mechanical Systems. Development of methods for formulating differential equations to model mechanical systems, including formalisms of Newton-Euler, Lagrange, and virtual work methods to two- and three-dimensional systems. Prerequisite: 190, Math 198. FALL. [3]

284. Modeling and Simulation of Dynamic Systems. Incorporates bond graph techniques for energy-based lumped-parameter systems. Includes modeling of electrical, mechanical, hydraulic, magnetic and thermal energy domains. Emphasis on multi-domain interaction. Prerequisite: 234. FALL. [3]

320. Statistical Thermodynamics. Old and modern quantum theory, including H atom, rigid rotor, and harmonic oscillator. Atomic and molecular structure and spectra. Maxwell-Boltzmann statistical model for ideal, chemically reacting, electron, or photon gas. Introduction to Gibbs method. Prerequisite: 220b. SPRING. [3]

324. Low Reynolds Number Flow. Dynamics of incompressible fluids in situations where viscous effects are significant or dominant. Review of the Navier-Stokes equations; exact solutions to the Navier-Stokes equations; laminar jets and wakes; microhydrodynamics; fluid stability. Prerequisite: 263 or equivalent. SPRING. [3]

325. High Reynolds Number Flow. Dynamics of incompressible fluids in situations where viscous effects are typically small. Review of the Navier-Stokes equations; two- and three-dimensional potential flows, with applications to thin airfoil theory and free streamline theory; inviscid flows with vorticity; boundary layer theory; fundamental turbulence theory. Prerequisite: 263 or equivalent. SPRING. [3]

326. Gas Dynamics. Study of compressible fluid flow from subsonic to supersonic regimes in confined regions and past bodies of revolution. Includes heat transfer, frictional effects, and real gas behavior. Prerequisite: 224. SPRING. [3]

327. Energy Conversion Systems. An advanced study of energy conversion systems that include turbomachinery, positive displacement machinery, solar energy collection and combustion, with consideration for optimizing the systems. Prerequisite: consent of instructor. FALL. [3]

331. Robot Manipulators. (Also listed as Electrical Engineering 331) Dynamics and control of robot manipulators. Includes material on Jacobian matrix relating velocities and static forces, linear and angular acceleration relationships, manipulator dynamics, manipulator mechanism design, linear and nonlinear control, and force control manipulators. Prerequisite: 271. SPRING. [3]

333. Topics in Stress Analysis. An investigation of thermal stress, transient stress, and temperatures in idealized structures: consideration of plasticity at elevated temperatures; and some aspects of vibratory stresses. Prerequisite: consent of instructor. FALL. [3]

336. Linear Control Theory. Classical and modern approaches to the analysis and design of single-input/single-output (SISO) and multiple-input/multiple-output (MIMO) linear time invariant control systems. Classical (frequency-domain) and modern (state-space) approaches to SISO and MIMO control, including optimal control methods. Credit is given for only one of ME236 or ME336. Prerequisite: 234. FALL. [3]

343. High-Performance Computing for Engineers. (Also listed as Computer Science 343) Introduction to high-performance computing. Engineering applications. Focus on high-speed cluster computing. Class project applying high-performance computing to various research topics. FALL. [3]

348. Convection Heat Transfer. A wide range of topics in free and forced convection is discussed. Solutions are carried out using analytical, integral, and numerical methods. Internal and external flows are considered for both laminar and turbulent flow cases. Convection in high speed flow is also studied. Prerequisite: 248, 325a. SPRING. [3]

351. Adaptive Control. Introduction to adaptive control systems. Real-time parameter estimation methods. Self-tuning regulators. Model reference adaptive control. Adaptive control for nonlinear systems. A research project is required. Prerequisite: 336. SPRING. [3]

352. Nonlinear Control Theory. Introduction to the concepts of nonlinear control theory. Topics include phase plane analysis, nonlinear transformations, Lyapunov stability, and controllability/observability calculations. A multidimensional geometric approach to these problems is emphasized. Prerequisite: Math 194. SPRING. [3]

353. Design of Electromechanical Systems. Analog electronic design for purposes of controlling electromechanical systems, including electromechanical sensors and actuators, analog electronic design of filters, state space and classical controllers, and transistor-based servoamplifiers and high voltage amplifiers. The course has a significant laboratory component in which students are expected to design and fabricate circuits to control electromechanical systems. Implementation of digital controllers is also covered. Prerequisite: 234. FALL. [3]

359. Advanced Engineering Vibrations. The development and application of Lagrange's equations to the theory of vibrations. Nonlinear systems and variable spring characteristics are analyzed by classical methods and by digital computer techniques. Applications to the design of high speed machines are emphasized. Prerequisite: 259; Math 234, Math 294. SPRING. [3]

363. Conduction and Radiation Heat Transfer. A comparative study of available methods for solution of single and multidimensional conduction heat transfer problems. Both steady and transient problems are considered. Mathematical and numerical methods are stressed. Radiant exchange between surfaces separated by non-participating media is studied. Numerical methods are developed and discussed for non-isothermal surfaces and combined radiation and conduction problems are solved. Prerequisite: 248. SPRING. [3]

365. Micro/Nanoscale Energy Transport. Theoretical examination of energy transport by electrons and phonons and modeling of transport phenomena in crystalline solids at reduced-length scales. Particle transport models and solution methods for energy carriers in the context of semiconductor electronics, direct energy conversion devices, and nanostructure. FALL. [3]

366. Combustion. Introduction to combustion processes. Topics include combustion thermodynamics, chemical kinetics, premixed flame theory, diffusion flame theory, ignition and detonation. Prerequisite: 220b, 224. SPRING. [3]

369. Master's Thesis Research.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

389. Master of Engineering Project. Not for M.S. or Ph.D. students. [0]

391–392. Special Topics. A course based on faculty research projects and highly specialized areas of concentration. [Variable credit: 1–3 each semester]

393–394. Independent Study. Readings and/or projects on advanced topics in mechanical engineering under the supervision of the faculty. Consent of instructor required. [Variable credit: 1–3 each semester]

397–398. Seminar. [0–0]

399. Ph.D. Dissertation Research.

3995. Half-time Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

Medicine, Health, and Society

DIRECTOR Arleen Tuchman

ASSOCIATE DIRECTOR David L. Boyd

Affiliated Faculty

PROFESSORS Kathryn Anderson (Economics), Michael Bess (History), Leonard Bickman (Psychology and Human Development), James Blumstein (Health Law and Policy), Frank Boehm (Obstetrics and Gynecology), Peter Buerhaus (Nursing), Vera Chatman (Human and Organizational Development), Larry Churchill (Medicine), Ellen Clayton (Pediatrics and Law), Jay Clayton (English), Bruce Compas (Psychology and Human Development), Richard D'Aquila (Infectious Diseases), Carolyn Dever (English), Dennis Dickerson (History), Kathryn Donato (Sociology), James Foster (Economics), Volney Gay (Religious Studies), Lenn Goodman (Philosophy), Thomas Gregor (Anthropology), Joni Hersch (Law and Economics), George Hill (Microbiology and Immunology), Gary Jensen (Sociology), Carl Johnson (Biological Sciences), Kazuhiko Kawamura (Electrical Engineering), Jana Lauderdale (Nursing), Pat Levitt (Pharmacology), Elizabeth Lunbeck (History), Leah Marcus (English), John McCarthy (German), Randolph Rasch (Nursing), Timothy McNamara (Psychology), Linda Norman (Nursing), Charles Scott (Philosophy), Sharon Shields (Human and Organizational Development), Arnold W. Strauss (Pediatrics), John Tarpley (Surgery), Patricia Temple (Pediatrics), Arleen Tuchman (History), Sten Vermund (Pediatrics and Global Health), Bart Victor (Organization Studies), Kip Viscusi (Law and Economics), Lynn Walker (Pediatrics and Psychology and Human Development), Kenneth Wallston (Nursing and Psychology), Laurence Zwiebel (Biological Sciences)

ASSOCIATE PROFESSORS Victor Anderson (Religious Studies), Gregory Barz (Ethnomusicology), Tony Brown (Sociology), Karen Campbell (Sociology), Monica J. Casper (Sociology and Women's and Gender Studies), Beth Conklin (Anthropology), Kate Daniels (English), Kathy Gaca (Classics), Craig-Anne Heflinger (HOD, Peabody), Elizabeth Heitman (Medicine), Kathleen Hoover-Dempsey (Psychology and Human Development), Lynda L. LaMontagne (Nursing), Jane Landers (History), Melanie Lutenbacher (Nursing), F. Carter Philips (Classical Studies), Matthew Ramsey (History), Ruth Rogaski (History), Norbert Ross (Anthropology), David Schlundt (Psychology), Benigno Trigo (Spanish), Holly Tucker (French), David W. Wright (Chemistry)

ASSISTANT PROFESSORS Mark Bliton (Medicine), Laura Carpenter (Sociology), Sara P. Figal (German), Rolanda Johnson (Nursing), Chase Lesane-Brown (Psychology and Human Development), Scott Pearson (Surgery), Josh Perry (Medicine), Michele Salisbury (Nursing), Timothy J. Vogus (Management and Organization Studies)

DEGREE OFFERED: *Master of Arts*

✦ GRADUATE study in medicine, health, and society at Vanderbilt offers an interdisciplinary Master of Arts and a graduate certificate for students interested in studying health-related beliefs and practices in their social and cultural contexts. It is available to graduate and professional students from the six participating Vanderbilt schools (Arts and Science, Divinity, Law, Medicine, Nursing, and Peabody). External candidates are also considered for admission, as are Vanderbilt undergraduates applying through the 4+1 program in the College of Arts and Science.

MHS draws on a variety of fields in the social sciences and humanities—anthropology, economics, history, literature, psychology, sociology, philosophy/ethics, and religious studies. It should be of particular interest to students preparing for careers in a health-related profession, but also has much to offer any graduate or professional student interested in examining an important part of human experience from multiple perspectives and developing a critical understanding of contemporary society.

Master of Arts

Students may choose a thesis option (24 hours of course work plus thesis) or non-thesis option (30 hours). The thesis should draw on at least two disciplines.

Requirements include the 3-hour core colloquium (MHS 300) and an additional 21 or 27 hours (depending on the option) of courses approved for the MHS graduate program. At least 6 of these hours must be at the 300 level, including independent study, the graduate internship, and graduate service-learning. All students are strongly encouraged to take at least one graduate seminar.

It is expected that students who can devote themselves to the MHS program full time will complete their studies in three terms (i.e., two semesters and one summer or three semesters). However, the length of the program will be flexible to accommodate the needs of different constituencies.

Graduate Certificate

The certificate is available only to current graduate students. Requirements include the 3-hour core colloquium (MHS 300) and an additional four courses drawn from the list of approved courses, of which at least one must be at the 300 level. Students are required to submit a paper to the MHS curricular committee for evaluation.

300. Graduate Colloquium. Introduction to graduate-level interdisciplinary work in medicine, health, and society, drawing on the perspectives of anthropology, economics, history, philosophy, political science and policy studies, psychology, religious studies, and sociology. [3]

305. Foundations of Global Health. Study of determinants of health and interventions used to better health, particularly in low-resource settings. Core research and evaluation methodologies used in the field. SPRING. [3] Vermund, Sahasrabudhe.

390a–390b. Independent Study. A program of independent readings and research in a minimum of two disciplines, to be selected in consultation with a faculty adviser and subject to the approval of the CMHS director. FALL, SPRING. [3–3].

393a–393b–393c. Graduate Internship.

393a. Internship Training. Must be taken concurrently with 393b and/or 393c. F ALL, SPRING. [1–3]

393b. Internship Research. Students will write a substantial research paper under the supervision of a Vanderbilt faculty member. FALL, SPRING. [3]

393c. Internship Readings. Readings and a substantial interpretive essay on topics related to the internship training, under the supervision of a Vanderbilt faculty member. FALL, SPRING. [3]

394a–394b–394c. Graduate Service Learning.

394a. Service Learning. Must be taken concurrently with 394b and/or 394c. After completing the experience, all students must write a thorough report. FALL, SPRING. [1–3].

394b. Service Learning Research. Students will write a substantial research paper under the supervision of a Vanderbilt faculty member, on a topic related to their service learning experience. FALL, SPRING. [3]

394c. Service Learning Readings. Readings and a substantial interpretive essay on topics related to the service learning experience, under the supervision of a Vanderbilt faculty member. FALL, SPRING. [3]

398. Master's Thesis Research. [0]*Other Approved Courses*

Additional courses not on this list may be approved at the discretion of the CMHS director. Graduate students enrolled in 200-level courses will complete additional work in order to gain graduate credit.

ANTHROPOLOGY: 240, Medical Anthropology; 250, Anthropology and Healing; 260, Medicine, Culture, and the Body; 267, Life, Death, and the Human Body; 329, The Anthropology of Death: Body, Place, and Memory.

DIVINITY/RELIGION: 3053, Seminar: Contemporary Psychotherapy and Pastoral Counseling; 3060, Freudian Theories and Religion; 3061, Post-Freudian Theories and Religion; 3062, Research in Religion and Health; 3066, Health and Salvation; 3068, Religion and Coping; 3069, Theories of Personality; 3084, Readings in Heinz Kohut and Self-Psychology; 3099, Pastoral Care for Persons with Addictions and Mental Disorders; 3752, The Religious Self According to Jung; 3755, Critical Issues in Psychotherapy; 3452, Ethics, Law, and Medicine; 3464, Seminar in Clinical and Research Ethics; 3951, Methods in Ethics; 3977, Reading Course in Medical Ethics; 3504, Freud and Jewish Identity.

ECONOMICS: 268, Economics of Health; 312a–312b, Health Economics.

ENGLISH: 243, Literature, Science, and Technology (as appropriate). *Note:* topics vary; the CMHS director will approve versions with sufficient MHS content for credit toward this program.

HISTORY: 280, Modern Medicine; 281, Women, Health, and Sexuality; 282, Chinese Medicine; 283, Medicine, Culture, and the Body (same as Anthropology 260).

NURSING: 225, Population-Based Health Care, 231a, Introduction to Nutrition; 231b, Nutrition and Health: Issues and Insights; 231c, Health and Wellness; 226, Health Care Systems: Micro Issues; 227, Health Care Systems: Macro Issues; 325, Interdisciplinary Aspects of Death and Dying; 333, The Evolution of Midwifery in America; 381a, Introduction to Health Informatics; 395b, Concepts of Public Health Management of Emergencies/Disasters; 396b, Research in Religion and Health; 396d, Special Topics: Complimentary and Alternative Therapies; 396L, Global Populations at Risk: Interdisciplinary Perspectives.

PHILOSOPHY: 239, Moral Problems; 245, Humanity, Evolution, and God; 256, Philosophy of Mind; 270, Ethics and Medicine; 335, Philosophy and Medicine I; 336, Philosophy and Medicine II.

PSYCHOLOGY: 215, Abnormal Psychology; 231, Social Psychology; 232, Mind and Brain; 235, Biological Basis of Mental Disorders; 240, Cognition, Consciousness, and Self; 243, Feminist Approaches to Clinical Practice; 244, Introduction to Clinical Psychology; 245, Emotion; 246, Schizophrenia; 247, Depression; 250, Control of Human Behavior; 252, Human Sexuality; 266, Interpersonal and Intergr oup Relations; 268, Health Psychology; 277, Brain Damage and Cognition; 301a–b, Advanced General Psychology, as appropriate [topics vary; the CMHS director will approve versions with sufficient MHS content for credit toward this program]; 306, Evolutionary Psychology; 307, Gr oup Process and Structure; 310, Research Methods in Clinical Psychology; 342, Seminar in Social Psychology; 352, Seminar in Clinical Psychology; 361, Interdisciplinary Seminar in Social Psychology.

PSYCHOLOGY AND HUMAN DEVELOPMENT (PEABODY): 2890P, Ethics for Human Development Professionals; 3040P, Field Research Methods; 3150P, Program Evaluation; 3360P, Behavioral Pediatrics and Child Health Psychology; 3450P, Seminar in Systems and Community Psychology; 3550P, Sociobiology; 3570P, Seminar in Behavioral Biology; 3600P, Developmental Psychology; 3630P, Seminar in Social and Personality Development; 3700P, Theories of Personality; 3750P, Social Psychology; 3780P, Current Research in Social Psychology; 3790P, Advanced Seminar in Personality and Social Psychology.

SOCIOLOGY: 220, Population and Society; 237, Society and Medicine; 257, Gender, Sexuality, and the Body; 264, Social Dynamics of Mental Health; 268, Race, Gender, and Health.

Microbiology and Immunology

CHAIR Jacek Hawiger

DIRECTOR OF GRADUATE STUDIES Christopher R. Aiken

PROFESSORS EMERITI John H. Hash, David T. Karzon

PROFESSORS Christopher R. Aiken, Dean W. Ballard, Mark R. Boothby, James Crowe, Richard T. D'Aquila, Mark R. Denison, Terence S. Dermody, Jacek Hawiger, J. Harold Helderman, George C. Hill, Sebastian Joyce, Alexander R. Lawton, Eugene M. Oltz, Theodore Pincus, Donald H. Rubin, H. Earl Ruley, Subramaniam Sriram, James Ward Thomas, Luc Van Kaer, Peter F. Wright, Mary Zutter

ASSOCIATE PROFESSORS Thomas N. Aune, Joey V. Barnett, Timothy Cover, David W. Haas, Douglas Kernodle, Andrew J. Link, Geraldine G. Miller, Louise A. Rollins-Smith

ASSISTANT PROFESSORS Wonder Drake, Spyros Kalamas, Borden Lacy, Eric Sebzda, Erik Skaar, John Williams

RESEARCH ASSISTANT PROFESSORS Danya Liu, Xue-Yan Liu, Chang-Yuan Ni, Maria Pia G. Pasquale, Lan Wu

RESEARCH INSTRUCTORS Oleg Osipovich, Ruth Ann Veach, Jing Zhou

DEGREES OFFERED: *Master of Science, Doctor of Philosophy*

✂ STUDENTS interested in microbiology and immunology participate in the Interdisciplinary Graduate Program in the Biomedical Sciences during their first year (see Biomedical Sciences). The second year of study

comprises required and elective courses in Microbiology and Immunology for a total of at least 24 hours of formal course work toward the Ph.D. degree.

The program in microbiology and immunology is designed to provide a broad background in modern virology, molecular and cellular immunology, bacteriology, molecular genetics and pathogenesis, functional genomics, biodefense, and biotechnology. Research experience in a specific area provides the basis for a dissertation. Entering students normally serve brief apprenticeships in the laboratories of four faculty members during the first year as preparation for choosing a field of study (see course description of Microbiology 327). Dissertation research may be initiated in any of the following areas:

- Signal transduction and gene transcription in T and B cells; developmental immunology and cell-mediated immunity in parasitic and viral infections (*Aune, Ballard, Boothby, Crowe, Hill, Joyce, Miller, Oltz, Rollins-Smith, Sebzda, Sriram, Thomas, Van Kaer*);
- Molecular biology of viruses, including DNA- and RNA-containing tumor viruses (*Aiken, Crowe, D'Aquila, Denison, Dermody, Rubin, Williams*);
- Molecular cell biology of inflammation (*Hawiger, Oltz, Ruley, Van Kaer*);
- Mechanism of action of bacterial toxins (*Cover, Hawiger, Lacy, Skaar*);
- Molecular genetics (*Link, Ruley, Skaar*);
- Functional genomics, structure, and proteomics (*Hawiger, Lacy, Link, Oltz, Ruley, Van Kaer*).

Emphasis is on basic research aimed at understanding molecular mechanisms of microbial and parasitic infections and the defenses mounted by the immune system. Students whose interests are primarily in diagnostic, ecological, or taxonomic aspects of microbiology are not encouraged to apply.

Doctoral study is emphasized. However, M.S. degrees are granted under special circumstances and may require a research thesis.

327. Experimental Methods in Microbiology. Laboratory work concerned with (a) regulation of gene transcription; (b) signal transducing molecules and pathways; (c) entry and replication of mammalian viruses; (d) techniques in nucleic acid and peptide chemistry, rapid methods of DNA sequencing, gene knock-out in transgenic animals, design of probes, antigens, and synthetic vaccines; and (e) structure-function analysis of ligands, receptors, toxins, and transcription factors. Available only to M&IM students. Admission to course, hours, and credit by arrangement. FALL, SPRING, SUMMER. [2-4] Staff.

328 2. Molecular Virology. The interaction of animal viruses with their host cells, discussed at the molecular and cellular level as model systems. Special emphasis on current literature and methodology. Prerequisite: A course in biochemistry. FALL. [3] Aiken and Staff.

328 3. Molecular and Cellular Immunology. The cellular and molecular foundations of the immune response system and the humoral and cellular reactions that result from immunologic interactions. Two lectures per week and seminars presented by students. Prerequisite: IGP 300a, 300b, and 301, or equivalent. FALL. [3] Oltz and Staff.

328 4. Focal Topics in Microbiology and Immunology. The main objective of this course is to guide students through "real life" cases illustrating dynamic features (entry, colonization, spread, injury, immune response) of the pathogen-host relationship. Small discussion

groups led by a faculty preceptor will focus on twelve topics contained in booklets designed for self-directed study. The element of critical thinking in analysis of questions, concepts, and required literature will be introduced. Moreover, graduate students will gain "clinical perspective" to the molecular pathogenesis of microbial and immune diseases important for future research proposals and grant applications. Prerequisite: IGP 300a, 300b, 301, or equivalent. *Note: Interested students must discuss their qualifications with the course director prior to enrolling.* SPRING [2] Van Kaer and Staff.

332. Foundations in Microbiology and Immunology I. The objectives of this course are to alert students to important original research articles in microbial genetics and pathogenesis, to apply methods of scientific logic for critical analysis of the knowledge presented in the articles, and to help students present complex data and conclusions to an audience. SUMMER. [2] Skaar and Staff.

333. Foundations in Microbiology and Immunology II. Second semester of required course work. Original research articles focus on virology. Prerequisite: M&IM 332. FALL. [3] Ruley and Staff.

334. Foundations in Microbiology and Immunology III. Third semester of required course work. Original research articles focus on immunology. Prerequisite: M&IM 332 and 333. SPRING. [1] Boothby and Staff.

335. Research Proposals: Preparation and Critical Review. An essential skill for scientists in an academic setting is the ability to obtain extramural research funding through peer reviewed grant applications. This course will offer didactic sessions in which the process of preparing and reviewing grant applications is discussed. Each student will write a grant application using the NRSA format for postdoctoral fellowships. The student should propose research in one of the four major emphasis areas of the department: microbial genetics, virology, immunology, or microbial pathogenesis. The initial grant submission will be reviewed by a faculty mentor. The student will amend the application according to the reviewer's comments and submit a final version. Procedures for reviewing grant applications will then be discussed. Two students and the original faculty mentor will provide a written review for each of the final grants. The course will conclude with a mock NIH study section in which grants are reviewed orally and scored. SPRING. [1] Crowe (Director), Thomas, Cover.

350. Cellular Microbiology of the Pathogen-Host Interaction. (Also listed as Cell and Developmental Biology 350) An interdisciplinary course designed to train students at the interface of molecular microbiology and cell biology. Students will be challenged to utilize new information from microbial genome sequencing to understand host cell subcellular components and signaling pathways. Prerequisite: A solid background at the graduate or undergraduate level in natural science curriculum, for example, molecular cell biology, microbiology, and immunology. SPRING. [3] Joyce, Skaar.

351. Functional Genomics and Proteomics: Applications to Immunobiology. Biological applications of functional genomics and proteomics in immunology. Topics include: 1) proteomic analysis of blood cells, vascular endothelial cells, and smooth muscle cells involved in immunity and inflammation, 2) functional genomics of immunobiology using genome-wide mutagenesis, 3) gene expression profiling of immune/inflammatory responses based on DNA microarray technology, 4) peptide/protein transduction and its applications to cell-based proteomics and intracellular protein therapy, 5) proteomic analysis of MHC antigens, 6) genomics and proteomic analysis of host-pathogen interactions, 7) genomic and proteomic analysis of immunological diseases, and 8) development and application of new genomic and proteomic strategies in immunology. SPRING. [2] Link, Hawiger, Staff.

352. Special Topics in HIV/AIDS Research. During the past twenty years since the identification of the AIDS virus, significant advances in understanding the disease have been made through basic studies of HIV replication, virus host-cell interactions, viral pathogenesis using

SIV animal models, and clinical studies of disease progression and manifestations. This course reviews recent advances in AIDS research as a platform for discussions of current research frontiers, with an emphasis on interactions of the virus with host cells. SPRING. [3] Aiken.

369. Master's Thesis Research.

377. Critical Issues in Cancer Biology. This seminar/tutorial will examine primary research papers to develop critical thinking skills on current topics in cancer research, including: cell growth control, signal transduction, regulation of gene expression, programmed cell death. The discussions will focus on discarded and controversial areas as well as cutting edge studies. Students can write a paper for additional credit. This course is offered to graduate students only. Post doctoral fellows may audit if space permits by permission of the instructor. Prerequisite: IGP 300a, 300b, and 301, or equivalent. SUMMER. [2–3] Ruley.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

399. Ph.D. Dissertation Research.

Molecular Physiology and Biophysics

CHAIR Roger D. Cone

DIRECTOR OF GRADUATE STUDIES Danny Winder

PROFESSORS Albert H. Beth, G. Roger Chalkley, Alan D. Cherrington, Roger J. Colbran, Jackie D. Corbin, Stephen N. Davis, Eric Delpire, Emmanuele DiBenedetto, Ronald B. Emeson, John H. Exton, John C. Gore, Daryl K. Granner, Jonathan L. Haines, Raymond Harris, Carl H. Johnson, Robert MacDonald, Mark A. Magnuson, James M. May, Hassane Mchaourab, Owen P. McGuinness, Richard M. O'Brien, Jane H. Park, David W. Piston, Alvin C. Powers, Roland W. Stein, Kevin Strange, Marshall Summar, David H. Wasserman, P. Anthony Weil, John P. Wikswo Jr.

RESEARCH PROFESSORS Sharron H. Francis, K. Sam Wells

ASSOCIATE PROFESSORS Aurelio Galli, Linda Sealy, Phoebe L. Stewart, James S. Sutcliffe, Jeanne Wallace, Scott Williams, Danny G. Winder

RESEARCH ASSOCIATE PROFESSORS Charles E. Cobb, Eric Hustedt, Robert Matthews, Mary C. Moore

ASSISTANT PROFESSORS Jeffrey Canter, Dana Crawford, Bruce Damon, Niels De Jonge, Maureen Gannon, Alyssa Hasty, Anne K. Kenworthy, Shawn E. Levy,

Douglas P. Mortlock, Kevin Niswender, Marylyn DeRiggi Ritchie, Masakazu Shiota

RESEARCH ASSISTANT PROFESSORS Hanane Koteiche, Michael McCaughey, Deborah Murdock, Richard L. Printz, Joseph Solus, Richard R. Whitesell

RESEARCH INSTRUCTORS Julio Ayala, Sheng-Song Chen, Dale S. Edgerton, Subhadra Gunawardana, Heinrich Matthies, Christopher Olsen, Nathalie Schnetz-Boutaud, Saraswathi Viswanathan

DEGREE OFFERED: *Doctor of Philosophy*

✚ STUDENTS interested in this program participate in the Interdisciplinary Graduate Program in the Biomedical Sciences or Chemical and Physical Biology program during the first year (see Biomedical Sciences). The

second year comprises required and elective courses in Molecular Physiology and Biophysics for a total of at least 24 hours of formal course work toward the Ph.D. degree. Variations are permitted in the number of formal course hours above the minimum of 24 required for the degree. A thesis-based master's degree is awarded only under special circumstances.

The emphasis of the graduate program is on research and research training in the areas of molecular and cell biology, cellular regulation and endocrinology, electrophysiology and biophysics, whole animal physiology, and genetics. Students obtain a general background in physiology, biochemistry, molecular biology, and genetics through course work and laboratory exercises. Students are encouraged to rotate freely among various research laboratories in their first year with interests in the areas mentioned above in order to select a particular area and thesis adviser for dissertation research.

Research areas available to the student include hormonal and developmental aspects of gene control at the molecular level, with emphasis on the role played by DNA-protein interactions. There is also a focus on cellular aspects of hormonal regulation including mechanisms of glucose, fatty acid and ion transport, as well as the mechanism of action of hormonal second messengers such as cAMP, cGMP, and Ca²⁺. Studies are conducted, using various biophysical techniques, to study membrane function and the action of proteins in membranes and free solution, with a focus on the regulation of synaptic transmission. Studies are also carried out to investigate the hormonal regulation of metabolism in whole animal models. Examination of the genetic basis of neurological and metabolic disorders is also ongoing in the department. Research in the department has relevance to a range of human diseases including diabetes, cancer, nutritional deficiencies, developmental abnormalities, and addiction.

322. Physiological Techniques and Preparations. For advanced students prior to admission into candidacy for Ph.D. degree. FALL, SPRING, SUMMER. Hours and credit by arrangement. Beth and Staff.

323. Advanced Neurophysiology. (Also listed as Pharmacology 323 and Neuroscience 324) Recent findings concerning the structure, function, and pharmacology of ion channels. Topics will include the relationship between amino acid sequence, protein subunit structure, and function of both voltage- and ligand-gated channels; the relationship between channel structure and pharmacology; the interaction of drugs with channels and receptor/channel proteins, with special emphasis on the interaction of compounds with different functional channel states; indirect coupling between ion channels and neurotransmitter and hormone receptors. Classes will include both presentations by the instructors and discussion of recent publications by students. Prerequisite: consent of instructor. FALL, even numbered years. SPRING. [3] DeFelice (Pharmacology).

324. Tutorials in Physiology. The class meets once weekly. In the fall semester, graduate students critically evaluate research publications in areas of active research in the department (e.g., gene transcription, molecular biology, electrophysiology, membrane transport, intercellular signaling, beta cell biology, and regulation of intermediary metabolism). Also, there are faculty presentations on ancillary science skills, such as oral and poster presentations, and grant and proposal writing. In the spring semester, each student presents and

defends a short research proposal based on their current research area. FALL, SPRING. [1] Colbran, Stein, and Staff.

325. Physical Measurements on Biological Systems. (Also listed as Physics 325 and Biomedical Engineering 325) A survey of the state of the art in quantitative physical measurement techniques applied to cellular or molecular physiology. Topics include the basis for generation, measurement, and control of the transmembrane potential; electrochemical instrumentation; optical spectroscopy and imaging; x-ray diffraction for determination of macromolecular structure; magnetic resonance spectroscopy and imaging. One lecture and one recitation. Prerequisite: modern physics course or consent of instructor FALL, odd-numbered years. [3] Wikswo.

326. Exercise Physiology. The responses of different physiological systems to exercise. The effect and role of exercise under special conditions such as diabetes, reproduction, heart disease, and orthopedics and rehabilitation. Invited speakers will discuss the clinical and scientific aspects of the above topics. Prerequisite: consent of instructor. SPRING, odd-numbered years. [1] Wasserman.

327. Molecular Endocrinology. A survey of the molecular biology of hormone action from the target cell surface to the nucleus. Special emphasis on (i) diabetes and obesity, (ii) how receptors and intracellular messengers mediate hormone action, and (iii) how hormones regulate gene expression. Discussion of the use of genetic, molecular biology, and biochemical techniques to study hormone action. The faculty encourage an interactive atmosphere in the class through the discussion of seminal papers. FALL. [2] Colbran, O'Brien, Hasty, Niswender.

328. Metabolic Regulation in vivo. The hormonal regulation of fuel metabolism in the whole animal. Techniques which are used to study carbohydrate, lipid, and protein metabolism in vivo are discussed, as well as metabolic regulation in the normal and stressed state. Conditions such as fasting, exercise, infection, and hypoglycemia are also examined. A basic knowledge of physiology and biochemistry is required. Prerequisite: 321 or consent of instructor. FALL. [2] Shiota and Staff.

330. Human Physiology and Molecular Medicine. Lectures and research correlations on advanced aspects of human physiology, with emphasis on communication between and control of the major tissue types and organ systems. Recent biochemical and molecular biology research findings will be incorporated into the study of normal physiology and pathophysiology. This course is required of all graduate students majoring in Molecular Physiology and Biophysics. Prerequisite: consent of instructor. FALL. [3] Cobb.

332. Regulation of Gene Transcription. This course entails an analysis of both past and current literature in the field of eukaryotic transcription. Class meetings are fully interactive, and require extensive input and critical evaluation of assigned readings from students. All class meetings center around detailed discussions of the original research literature. The topics covered include eukaryotic RNA polymerase structure and function, nucleosome structure and chromatin structure and effects on transcription, the basal transcription machinery, cell- and tissue-specific transcription factors and molecular mechanisms of gene control. Particular emphasis is placed upon assessing the appropriateness of controls, understanding of techniques, and integration of detailed molecular-level experiments to biological regulation. Prerequisite: comprehensive undergraduate-level courses in biochemistry, molecular biology, and/or molecular genetics; IGP Bioregulation I. SPRING. [2] Weil and Staff.

333. The Molecular Endocrinology of Obesity and Diabetes. This course is designed to introduce first-year IGP students to some of the major areas of interest in the fields of obesity and diabetes research. In the first part of the course the lecturers will discuss the characteristics of diabetes and obesity in terms of whole-body metabolism. The use of mouse models,

a major tool to study metabolism, will be emphasized. The second part of the course will focus on the insulin-producing cells of the pancreas: how they develop, how insulin secretion is regulated, and how insulin gene transcription is controlled. The third part of the course will focus on the mechanism of insulin action at the molecular level. The final part of the course will focus on the regulation of lipid metabolism and the latest theories on the molecular causes of insulin resistance and obesity. The NIH-funded Molecular Endocrinology Training Program (METP) provides support for eight IGP students in the second and third years of their graduate studies. The METP strongly encourages students who wish to be considered for METP funding take this Spring Elective. JANUARY 4–FEBRUARY 8. [1] O'Brien and Staff.

340. Human Genetics I. Designed to cover background and latest advances in human genetics. Topics will include an overview of mutational mechanisms, cytogenetics (detection and description of chromosomal abnormalities), biochemical genetics (gene defects in biochemical pathways), molecular genetics (gene structure, function, and expression), population genetics (heritability, quantitative traits, variance analysis), disease gene discovery (study design, statistical and molecular techniques), and genetic epidemiology (genetic linkage analysis, association studies, gene-gene and gene-environment interaction). Topics will be discussed with reference to specific human genetic diseases. FALL. [3] Summar and Staff.

341. Human Genetics II. This course will cover the statistical, population, and analytical aspects of modern human genetics research. Topics to be covered include human population genetics, quantitative genetics, linkage and association analyses, computational genetics, and evolutionary genetics. Clinical examples, subject ascertainment, and study design will also be emphasized. Students must have a strong understanding of Mendelian genetics and basic biostatistics. Prerequisite: consent of instructor. SPRING. [3] Haines and Staff.

345. Cellular and Molecular Neuroscience. (Also listed as Cell and Developmental Biology 345, Neuroscience 345, Pharmacology 345) This course is a required entry-level course for students in the Cell and Molecular Track of the Neuroscience Graduate Program at Vanderbilt that should be taken in the first graduate school year. It also serves as an elective for medical students and graduate students in a number of other programs. Its goal is to expose students to fundamental concepts and techniques in molecular and cellular neuroscience and provide a theoretical context for experimental analysis of brain function and disease. The course is divided into three modules. *Module I: Neural Anatomy and Development* provides an overview of the anatomy of the nervous system and neurotransmitters and examines concepts in neural pattern formation, neuronal migration, axon guidance, and synapse formation. *Module II. Signaling, Plasticity, and Modulation* reviews biophysical and molecular concepts relating to neuronal membrane excitability, secretion, and plasticity. *Module III: Neural Diseases and Disease Models* focuses on specific brain disorders such as epilepsy, pain disorders, Alzheimer's disease, depression, and schizophrenia and current models used to investigate their origin and/or treatment. This course combines faculty lecture with discussion of original articles, with an emphasis on fundamental concepts and the elucidation of important research paradigms in the discipline. Faculty and assistants guide students through important research paradigms with a critical analysis of the primary literature in the topic area. Prerequisite: Bioregulation I (IGP 300A) or consent of instructor. Course directors may consider undergraduate course work in cell biology or biochemistry to meet this requirement. SPRING. [4] Currie, Carter, and Staff.

349. Genetics of Model Organisms. (Also listed as Cell and Developmental Biology 349, Human Genetics 349) Basic genetic principles across a broad range of organisms (yeast, *C. elegans*, *Drosophila melanogaster*, plants, mouse, zebrafish) that are used in genetic analyses to investigate molecular pathways of interest for human disease will be presented. This course will provide students with in-depth terminology and understanding of the advantages, applications, and approaches specific to each organism. Genomic and bioinformatics tools

that facilitate genetic analysis in each species will be emphasized. Specific examples of how each model organism has successfully contributed to elucidation of a human disease gene, pathway, or genetic principle will be presented. Course combines faculty lectures with student presentation and discussion of original articles to emphasize the uniqueness of each model system. Prerequisite: one statistics course at the upper undergraduate level or higher and Fundamentals of Genetic Analysis (MPB 385), or permission of instructor. Offered every other year. SPRING. [3] Southard-Smith and Staff.

369. Master's Thesis Research.

370. Tutorials in Human Genetics. A weekly seminar critically evaluating current and past scientific literature from many areas of genetic research. The focus will be on study methods and analysis. FALL. [1] Canter.

371. Tutorial in Statistical and Population Genetics. The class meets once weekly. Graduate students critically evaluate research publications in areas of statistical methods in human genetic analysis and in the area of human population genetics. Also, there are faculty presentations on ancillary science skills, such as oral and poster presentations, and grant and proposal writing. SPRING. [1] Li, Crawford.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

385. Fundamentals of Genetic Analysis. This course is designed to accomplish three goals: (1) introduce students to critical topics of genetic research, (2) introduce students to important areas of genetic research not covered in first-year course work, and (3) promote an understanding of classical genetic analysis by learning genetics using the original literature. The approach will be to use classic literature that defined significant problems in genetic research. Specific topics will include: genetic analysis (segregation, independent assortment and locus mapping), human pedigree analysis and disease gene mapping, and population/quantitative genetics. FALL. [4] Williams and Staff.

399. Ph.D. Dissertation Research.

Neuroscience

DIRECTOR Elaine Sanders-Bush

DIRECTOR OF GRADUATE STUDIES Louis J. DeFelice

PROFESSORS Michael Aschner, Jeffrey R. Balsler, Randolph Blake, Randy D. Blakely,

A. B. Bonds, Kendal Broadie, Vivien A. Casagrande, Jeffrey Conn, Louis J. DeFelice,

Ariel Y. Deutch, Ford F. Ebner, Ronald B. Emeson, Alfred L. George Jr., John Gore,

Vsevolod Gurevich, Jonathan L. Haines, Heidi E. Hamm, Stephan Heckers, Carl H.

Johnson, Jon H. Kaas, Craig Kennedy, Christine Konradi, Pat Levitt, Robert L.

Macdonald, Douglas McMahon, Timothy P. McNamara, Terry Page, John S. Penn,

Elaine Sanders-Bush, Jeffrey D. Schall, Subramaniam Sriram, Kevin Strange, Ronald G. Wiley, Laurence J. Zwiebel

ASSOCIATE PROFESSORS Bruce H. Appel, Jo-Anne Bachorowski, David Calkins, Bruce D.

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Isabel Gauthier, René Marois, David M. Miller III, Karoly Mirnics, Thomas J. Palmeri, Sohee

Park, Anna Roe, Bih-Hwa Shieh, Lilianna Solnica-Krezel, James S. Sutcliffe, Frank Tong,

William M. Valentine, Brian E. Wadzinski, Mark Wallace, Danny G. Winder, David H. Zald

ASSISTANT PROFESSORS Aaron Bowman, Michael Cooper, Kevin Currie, Kevin Ess, Martin Gallagher, Maureen Hahn, Peter Hedera, Jennifer Kearney, Greg Mathews, Bethann McLaughlin, Daniel Polley, Marilyn DeRiggi Ritchie, Michelle Southard-Smith, Gregg Stanwood, Donna Webb

DEGREE OFFERED: *Doctor of Philosophy*

✦ THE program of study provides a broad background in neuroscience and related disciplines, preparing a student for a career as a research investigator and teacher. Graduates are recruited for positions in academic institutions where the discipline of neuroscience is growing rapidly, in government and research institutes, and in the biotechnology industry.

The Ph.D. program requires a minimum of 24 hours of formal course work. Two areas of focus (tracks) are available: molecular and integrative. Students in the molecular track participate in the IGP (see Biomedical Sciences); during the first year, they complete an inter disciplinary core of course work through the IGP. A required set of modules includes three courses, of which the student chooses two. These courses include Cellular and Molecular Neuroscience, Systems Neuroscience, and Cognitive Neuroscience. These courses survey the broad areas of neuroscience and are designed to link fundamental principles to contemporary research. Neuroscience Foundations, another required course, is taught the first and second semesters of the first year. Additional required courses include neuroanatomy and, depending on the track, advanced courses covering the electrical properties of nerves, molecular neuroscience, cognitive neuroscience, and biostatistics. An individualized elective schedule is designed that augments the required material in areas that relate directly to the chosen research. Areas of study include bases of perception, cognition and circadian rhythms, neural development, synaptic transmission, synaptic and systems plasticity, sensory perception and processing, neuropharmacology, neurotoxicology, neurogenetics, the etiology and treatment of neuropsychiatric and neurodegenerative diseases, and behavioral neurophysiology. An original research dissertation is required for the Ph.D. degree.

For additional information, see braininstitute.vanderbilt.edu.

302. Techniques and Preparations. Laboratory rotations undertaken by Integrative Track students that culminate in the selection of a thesis adviser. FALL, SPRING. [0–6]

320. Neuroscience Research Forum. Required of all students, and second-year students are required to take this course for credit. Students make oral presentations and are evaluated based on the clarity of the presentation and visual aids, as well as the ability of the presenter to answer questions. The course meets every other week for 1.5 hours with two students presenting at each session. FALL, SPRING. [0–1]

324. Advanced Neurophysiology. (Also listed as Pharmacology 323 and Molecular Physiology and Biophysics 323) Recent findings concerning the structure, function, and pharmacology of ion channels. Topics will include the relationship between amino acid sequence, protein subunit structure, and function of both voltage- and ligand-gated channels; the relationship between channel structure and pharmacology; the interaction of drugs with channels and receptor/channel proteins, with special emphasis on the interaction of compounds

with different functional channel states; indirect coupling between ion channels and neurotransmitter and hormone receptors. Classes will include both presentations by the instructors and discussion of recent publications by students. Prerequisite: consent of instructor. SPRING. [3] DeFelice.

325. Neuroscience Foundations. This two-semester course provides discussions on a broad range of neuroscience topics, ranging from reviews of historical concepts and individuals in neuroscience to science journalism. Other topics include scientific ethics, science policy, good grantsmanship, and communication skills. FALL, SPRING. [1–1] Early-Zald, Wallace, Konradi.

330. Cognitive Neuroscience. This course provides a broad understanding of the state of our knowledge in cognitive neuroscience. The emphasis is on the findings and concepts in the major branches of cognitive neuroscience, rather than techniques (although these will be discussed). The level of analysis will focus on human and non-human primate systems. Prerequisite: an introductory-level undergraduate course in neuroscience or physiological psychology. Basic knowledge of experimental cognitive psychology is desirable but not necessary. FALL. [3] Marois.

331. Advanced Topics in Mammalian Brain Development. Focuses on a specific topic in contemporary mammalian brain development. Areas of focus may include the role of early experience in the development of brain circuitry, growth factors as pleiotropic molecules in brain development, or the mechanisms that control the development of the cerebral cortex. FALL. [2]

335. Special Topics in Neuroscience (Also listed as Cell and Developmental Biology 335 and Psychology 335) Explores basic issues in neuroscience. Possible topics include neural development, neural plasticity, regeneration, organization and function of cortex, sensory systems, motor systems, and research methodology in neuroscience. A new topic is considered each semester. Prerequisite: Neuroscience 323 or equivalent course. FALL. [2] Casagrande.

336. Advanced Neuroanatomy (Also listed as Cell and Developmental Biology 336) Designed for graduate and medical students who want to explore in more detail topics covered in Neuroscience 323. Emphasis on advanced neuroanatomical techniques (electron microscopy, freeze-fracture, fluorescence microscopy), on an understanding of original current research conducted in neuroanatomy, and on clinical correlations. Students may elect to emphasize clinical correlations and do three five-week rotations in various subfields of neurobiology (neuro-oncology, surgery, etc.). Admission by consent of instructor. FALL, SPRING, SUMMER. [2] Norden.

340. Systems Neuroscience. Required for Neuroscience majors in the Integrative/Cognitive track. Allows students to develop a working knowledge of neural networks and brain systems and the techniques used to study these functions. Includes an introductory overview of neuroanatomy, physiology, and behavior, and then moves on to the sensory and motor systems, motivation, and learning and memory. FALL. [4] Casagrande/Deutch.

345. Cellular and Molecular Neuroscience. (Also listed as Cell and Developmental Biology 345, Molecular Physiology and Biophysics 345, Pharmacology 345) This course is a required entry-level course for students in the Cell and Molecular Track of the Neuroscience Graduate Program at Vanderbilt that should be taken in the first graduate school year. It also serves as an elective for medical students and graduate students in a number of other programs. Its goal is to expose students to fundamental concepts and techniques in molecular and cellular neuroscience and provide a theoretical context for experimental analysis of brain function and disease. The course is divided into three modules. *Module I: Neural Anatomy and Development* provides an overview of the anatomy of the nervous system and neurotransmitters and examines concepts in neural pattern formation, neuronal migration, axon guidance, and

synapse formation. *Module II. Signaling, Plasticity, and Modulation* reviews biophysical and molecular concepts relating to neuronal membrane excitability, secretion, and plasticity. *Module III: Neural Diseases and Disease Models* focuses on specific brain disorders such as epilepsy, pain disorders, Alzheimer's disease, depression, and schizophrenia and current models used to investigate their origin and/or treatment. This course combines faculty lecture with discussion of original articles, with an emphasis on fundamental concepts and the elucidation of important research paradigms in the discipline. Faculty and assistants guide students through important research paradigms with a critical analysis of the primary literature in the topic area. Prerequisite: Bioregulation I (IGP 300A) or consent of instructor. Course directors may consider undergraduate course work in cell biology or biochemistry to meet this requirement. SPRING. [4] Currie, Carter, and Staff.

346. Advanced Molecular Neurobiology. (Also listed as Pharmacology 346) This course examines molecular components and interactions that regulate neuronal development, signaling, and disease. Topics include development of neuronal identity, axonal transport, growth factors and cell death, axon guidance and synapse formation, electrical and chemical transmission, regulation of neuronal excitability and genetic analysis of signaling and neural disorders. Didactic and literature discussions provide students with a sound foundation for understanding the molecular bases underlying the development and function of the nervous system. Prerequisite: 345, Pharmacology 324–325, or consent of instructor. SPRING. [3] Emeson and Staff.

347. The Visual System. (Also listed as Cell and Developmental Biology 347, Psychology 336, Electrical Engineering 351) An interdisciplinary approach to how humans see and interpret their visual environment. Topics include the structure of the eye and brain (including optics), the physiology of individual cells and groups of cells, machine vision and models of visual function, visual attention, and mechanisms of complex visual perception. Lectures by faculty from Psychology, Engineering, and Cell and Developmental Biology. Graduate students attend one hour discussion section per week in addition to lecture, and turn in a more extensive paper than undergraduates. SPRING. [3] Lappin, Casagrande, Bonds (Electrical Engineering).

350. Independent Study. Qualified students work with individual faculty members in areas not covered in available courses. Prerequisite: approval by individual faculty member and program director. FALL, SPRING, SUMMER. [Variable credit: 1–3, with total credit limited to 3]

355. Integrative Neuroscience. Structure and function of nervous systems. Emphasis on vertebrate brain and the relationship of anatomy, physiology, and biochemistry to sensory perception, cognition, motor activity, and learning and memory. Prerequisite: 201. SPRING. [3] Norden.

365. Neurobiology of Disease. The goal of this course is to prepare students for intensive collaborations along the basic-translational-clinical continuum. The course is divided into five brain disease areas of focus (modules). In each module, clinical and pathological features, status of clinical research, animal models, and postulated cellular/molecular bases for the disease will be covered. Each module closes with a review of the clinical findings, and patient interviews with an emphasis on the health disparities of the disease, whether biological, social, or both. Five 1 hour modules can be taken in any combination and sequence. This course, an elective for Neuroscience majors, is co-taught by Vanderbilt and Meharry faculty. Prerequisite: introductory neuroscience course and consent of instructor. FALL, SPRING. [1–5] Sanders-Bush and Chirwa.

366. Molecular Basis of Neural Disease. This advanced course covers current concepts and models for neuropsychiatric disorders, including schizophrenia, depression, and autism, as well as Parkinson's Disease, trinucleotide repeat disorders, and stroke. Didactic presentations will focus on the molecular and genetic bases of these disorders, and will be

complemented by presentations of new papers as well as patient interviews when possible. Prerequisite: 345 or consent of instructor. SPRING. [2] Deutch.

376. Neurogenetics. This advanced course covers Mendelian genetics including relationships between mutational mechanisms and inheritance patterns. Topics highlighting genetics of neurological phenotypes will be discussed. Prerequisite: 345 or consent of instructor. SPRING. [2] Sutcliffe.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

399. Ph.D. Dissertation Research.

Nursing Science

DEAN Colleen Conway-Welch

PROFESSORS Peter I. Buerhaus, Colleen Conway-Welch, Mary Jo Gilmer, Jeffrey S. Gordon, Lynda L. LaMontagne, Larry E. Lancaster, Donna McArthur, Ann F. Minnick (Program Co-Director), Linda D. Norman (Program Co-Director), James Pace, Bonnie A. Pilon, Randolph F. R. Rasch, Vaughn G. Sinclair, Patricia A. Trangenstein, Kenneth A. Wallston, Elizabeth E. Weiner

RESEARCH PROFESSOR OF NURSING Nancy Wells

ASSOCIATE PROFESSORS Sarah C. Fogel, Joan E. King, Jana Lauderdale, Melanie Lutenbacher, Susan Newbold

RESEARCH ASSOCIATE PROFESSOR Mary S. Dietrich

ASSISTANT PROFESSORS Thomas L. Christenbery, Thomas H. Cook, Karen C. D'Apolito, Rolanda L. Johnson, Shelagh A. Mulvaney, Sheila H. Ridner, Michele H. Salisbury, Michael W. Vollman, Lois Wagner

NURSING INSTRUCTOR Elizabeth Moore

DEGREE OFFERED: *Doctor of Philosophy*

✂ THIS program prepares scholars for research and academic careers in major universities and for research positions in public or private sectors of health care. Two tracks of study are available: Clinical Research and Health Services Research. These areas of study are reflective of the overall research interests and expertise of School of Nursing faculty members and the resources available in the medical center, the university, the School of Nursing nurse-managed and interdisciplinary care delivery centers, and the Veterans Affairs Tennessee Valley Healthcare System (Nashville campus). More specifically, faculty research interests include such areas as stress and coping, perceived control, health promotion, oncology, pediatric palliative care, impact of chronic conditions on individuals and families, family violence, health psychology/behavioral medicine, life transitions, and symptom management. Health services research topics include clinical outcomes, workforce policy, and economic aspects of health care delivery.

Admission to the Ph.D. in Nursing Science Program is through the Graduate School, which oversees all doctoral programs in the university.

For additional information, go to www.nursing.vanderbilt.edu/phd. Application materials are online and may also be obtained from the Graduate School located in Kirkland Hall. Successful applicants to the program are those whose previous academic performance, letters of recommendation, Graduate Record Examination scores, and written goal statement meet admission standards for the School of Nursing and the Graduate School and whose research and career goals best match the school's research foci and faculty expertise.

The program requires 72 credit hours of study, of which 16 may be transferred from master's course work, pending review and approval by the graduate faculty. The core curriculum of the program includes 31 credit hours of required course work for all Ph.D. students, 15 credit hours of required course work specific to the selected track of study, and 10 credit hours of course work that supports the student's focus of research (4 research practica and 6 dissertation research credits).

Our course work is delivered using a combination of formats with limited on-campus visits. Students work with faculty mentors who guide and oversee their educational program from admission through completion of degree requirements. Students participate in intensive research experiences connected with faculty research projects and are exposed to a variety of research designs and analytic techniques. Requirements for the degree include successful completion of advanced course work, a qualifying paper, oral qualifying exam, and dissertation (including oral defense of proposal and findings). Full-time and part-time options are available.

Further information about the doctoral program can be obtained by writing the Ph.D. Program, Office of Admissions, Godchaux Hall, 461 21st Avenue South, Nashville, Tennessee 37240, calling (615) 322-3800, or visiting the Web site at www.nursing.vanderbilt.edu/phd.

302. Advanced Doctoral Seminar I. This course consists of a series of seminars focusing on issues relative to the dissertation, development of a program of research, and the role of the nurse scientist. The topics are selected by course faculty and the students who may be at various points of doctoral study in nursing. Topics and experiences may include proposal development, grant applications, mock proposal reviews, and dissemination of research findings. The seminar is required for two semesters, one-credit hour each semester. Prerequisite: completion or concurrent enrollment in NRSC 380. [1]

303. Advanced Doctoral Seminar II. This is the second seminar course in this series and focuses on the refinement and expansion of the student's ability to clearly articulate his/her phenomenon of interest. This course is designed to prepare students for the written qualifying examination and in developing his/her program of research. Prerequisite: completion of Advanced Doctoral Seminar I. [1]

304. Ethical and Legal Issues in Research. Provides an overview of issues related to the responsible conduct of research, including data management, vulnerable populations, authorship and publication, conflicts of interest and collaboration. Federal and institutional guidelines are included. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [1]

305. Informatics and Scholarly Inquiry. This course provides an overview of informatics, the transformation of data into information, knowledge, decisions, and actions to improve outcomes. To take advantage of electronic data mines, scholars of the future will need to understand the basics of databases and the structure of nursing vocabularies. Knowledge

management to support evidence-based practice in nursing will be a critical skill. In addition, this course prepares the student to use available technology tools to present, interpret, and organize data. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [2]

306. Research Design and Statistics I. This course focuses on understanding and applying the basic concepts of descriptive and relational research design and statistics. Students will be introduced to the full range of designs available to address research aims, moving from descriptive to experimental and quasi-experimental. After examining the relationship of research aims to research design, the nature of measurement, and causal inference, relevant statistical methods for visualizing, describing, and making inferences from data will be introduced. The focus will be on univariate and bivariate descriptive methods. Statistical computing packages will be used. Published research will be used to develop the student's ability to evaluate the design and statistical methods used to describe health care phenomena as well as relationships among them. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [3]

307. Research Design and Statistics II. The course expands the concepts and applications of RD&S I including an introduction to longitudinal and randomized control of design issues. Topics related to internal validity, experimental designs, and issues in comparing individuals and groups cross-sectionally and longitudinally will be detailed. Students will be introduced to issues in external validity and the relationships between internal and external validities. Parametric and non-parametric univariate comparative statistical methods used to analyze data resulting from cross-sectional and randomized controlled designs will be included. Students will be expected to generate and interpret results from statistical software and present relevant information in figures, tables, and text. Concepts will be studied within the context of evaluating published research. Prerequisite: completion of Research Design and Statistics I or consent of faculty. [3]

308. Research Design and Statistics III. This course is focused on advanced designs and multivariate statistical techniques. Design topics include advanced issues in external validity, field experimentation versus laboratory experiments, quasi-experimental and blended designs as well as special considerations for nested and complex longitudinal designs. Related statistical topics include advanced multiple linear regression methods (e.g. path and structural equation modeling), log-linear models and advanced techniques in survival and longitudinal data analysis. These methods and concepts will be discussed and evaluated through educational resources and published research using them. Students will have the opportunity to develop advanced skills in statistical applications most commonly used in their respective areas of interest. Prerequisite: completion of Research Design and Statistics II or consent of faculty. [3]

309. Special Topics in Quantitative Methods. This course focuses on the skills needed to implement common quantitative data collection methods. All students are expected to complete a module on survey item development, survey administration (including mail and computer techniques), and analyses because of the centrality of survey methodology to most of nursing research. Students may then select at least one module that improves their skills in any of the following methods: non-participant quantitative observation, physiological data collection, secondary analyses of regional and national data sets, or, as available, quantitative methods applicable to the student's program of research. Prerequisite: completion of Research Design and Statistics I or consent of faculty. [2]

310. Health, Health Care, Research, and Public Policy. This course explores and critically analyzes theoretical and empirical approaches to understanding dynamic synergies between research, nursing practice, health care organization, and public policy and their impact on health. Strategies for dissemination, translation, and evaluation of evidence-based research findings to support health care practices and public policies to measurably improve health

outcomes for selected populations and the student's phenomenon of interest will be discussed. Local, national, and global implications will be explored. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [2]

311. Role of Scientist in Academe, Community and World. This seminar course assists the student to develop a personal framework for behavior within academe, the scientific community, and the world beyond. Through readings and discussions, the student will explore a variety of viewpoints about the duties and responsibilities of an educated citizen scientist in an interdependent world. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [1]

312. Programs of Research and Grantsmanship. This course provides the foundational information necessary for developing a program of research. Focus is placed on acquiring practical skills necessary to develop a program of research, narrowing the focus of student's area of research, and developing the related plan of graduate studies and experiences. The course provides the foundation for content developed in greater depth throughout the doctoral program. Focus is placed upon developing the knowledge and practical skills necessary to investigate an area of research interest and draft a research proposal appropriate to current level of career development needs and/or phenomenon of interest. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [2]

313. Theories of Science. This course provides students with an introduction to the central theoretical and philosophical issues concerning the nature of science, the patterns of knowing and knowledge development, criteria for evaluating knowledge claims, and philosophy of science. The course will enable students to become knowledgeable about the forces affecting the development of knowledge and critical analyses of theories commonly used in nursing research. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [2]

350. Conceptual Foundations for Clinical Research. Critical analysis of theories, concepts, and research related to the promotion, protection, and restoration of health across the lifespan at individual, family, and community levels. Emphasis will be on the individual level. Students conduct a critical analysis of existing and emerging scientific knowledge in a chosen field of study. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [3]

352. Measurement in Clinical Research. This course examines the principles of measurement, procedures used for critical evaluation of clinical measures, and specific techniques for assessing validity, reliability, and the structure of measures for use in diverse populations. A variety of behavioral and physiologic measures are included. Development of new and modification of existing instruments are included. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [3]

353. Designing and Testing Clinical Interventions. Analysis of methodological, ethical, and practical issues related to the design and implementation of theory-based intervention studies. Students conduct a critical analysis of existing and emerging interventions related to their chosen field of study. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [3]

366. Curriculum Strategies for Health Professional Education. This course introduces the student to the foundations of learning theory and learning styles. The impact of technology on learning practices and the appropriate use of technology to facilitate learning is emphasized. Students will create electronic elements for effective learning and use a course management system. Copyright and fair use issues are discussed. Overall curriculum strategies that integrate content, organization, informatics, and sequencing of courses are discussed. Students will design a learning program that integrates learning styles, technology use, and a course management system. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [3]

367. Educational Evaluation for Learning in the Health Professions. This course explores issues related to evaluating educational offerings that employ technology. The advantages

and disadvantages of both traditional and more novel approaches to evaluation are discussed. Students will learn how to create online surveys along with principles of test and survey management. Issues surrounding online testing including access, privacy, and data input accuracy are emphasized. Overall program benchmarks are explored. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [3]

368. Contextual Nature of Health and Health Behaviors. This course explores and critically analyzes theoretical and empirical approaches to understanding the interaction of health and environment in affecting health by examining contextual factors that impact health and health behaviors of various system levels. Examines disparity (e.g., social and economic) as a determinant of health among individuals and sub-populations. Critique selected models of health, health behavior, community organization, and health care delivery and their usefulness to understand and impact selected health phenomena and various ethno-cultural populations and communities. Students critically analyze and synthesize the literature related to a selected phenomenon of interest. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [2]

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

380. Knowledge Synthesis in Nursing Science. This course provides a critical appraisal of the theoretical and empirical basis of nursing science. Theories and research generated to study phenomena related to nursing are evaluated and synthesized. Strategies for synthesizing extant knowledge in nursing are discussed. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [3]

381. Current Topics in Health Services Research. This course is designed to assist the student to develop expertise concerning the objectives, support mechanisms, limitations, and controversies of current HSR research initiatives and HSR organizations. Examples of initiatives include (but are not limited to) those of the IOM, governmental and private safety studies, QI/QA consortia, JCAHO, IHI, and other projects. The student will be expected to assess the relative place of her/his research interest in the current HSR environment and to begin to function within the professional role of a health services researcher. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [3]

382. Measuring Outcomes: Issues in Health Service Research Designs. In this course, the student will develop expertise in the design, measurement, and analysis of studies employing the five generic outcomes of greatest interest in outcomes studies: satisfaction, cost-effectiveness, mortality, health-related quality of life, and morbidity. The student will also be expected to develop an overview including measurement and analysis plans for a condition-specific outcome. The impact of the researcher's decisions regarding conceptual models, treatment definition, risk adjustment strategies, and the application of statistical techniques will be explored. At least one controversy attendant to each of the five generic outcomes will be debated in class. Prerequisite: completion of Research Design and Statistics I and II. [3]

383. Advanced Topics in Organizational Quality and Safety Research. The student will develop expertise in the measurements commonly used in nursing health services research related to organizational quality and safety. Emphasis will be placed on the challenges to measuring administratively mediated variables (e.g., capital, labor, and process inputs) as well as the design and analytic challenges attendant to multilevel organizational studies. Prerequisite: completion or concurrent registration in Measuring Outcomes. [3]

390. Independent Study in Nursing Science. Individualized study and reading in areas of mutual interest to the student and faculty member. Prerequisite: consent of instructor. [Variable credit: 1–3]

394. Special Topics in Qualitative Design. This course explores qualitative approaches to research, including their theoretical foundations and practical applications. A variety of qualitative methods are presented and discussed. Class participants have the opportunity to study one or two selected methods in depth. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [3]

395. Research Practicum. This course provides students with exposure to and involvement in the research process. Learning activities are based on student need and interest and determined according to best fit with available faculty research programs. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [Variable credit: 1–2]

399. Ph.D. Dissertation Research. Prerequisite: enrollment in the Ph.D. program and consent of faculty. [Variable credit: 0–6]

Pathology

See Cellular and Molecular Pathology

Pharmacology

CHAIR Heidi E. Hamm

VICE CHAIR Joey V. Barnett

DIRECTOR OF GRADUATE STUDIES Joey V. Barnett

PROFESSORS EMERITI Lawrence Berman, Wolf D. Dettbarn, Joel G. Hardman,
Jack N. Wells

PROFESSORS Michael Aschner, Malcolm Avison, Jeffrey Balsler, Joey V. Barnett,
Italo Biaggioni, Randy D. Blakely, Alan R. Brash, Kendal S. Broadie, H. Alex Brown,
Nancy J. Brown, Richard Caprioli, Jeffrey Conn, Louis J. DeFelice, Ariel Y. Deutch,
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Linton, Terry Lybrand, Robert Macdonald, Lawrence J. Marnett, Peter R. Martin, Richard
McCarty, Douglas McMahon, Herbert Y. Meltzer, Jason D. Morrow, Gregory R. Mundy,
John A. Oates, L. Jackson Roberts II, David Robertson, Dan M. Roden, Jeffrey Rottman,
Elaine Sanders-Bush, Richard Shelton, C. Michael Stein, Kevin Strange, Douglas E.
Vaughan, Ronald G. Wiley, Laurence Zwiebel

RESEARCH PROFESSOR David Hachey

ADJUNCT PROFESSORS John T. Clark, Lee E. Limbird, Sukhbir Mokha

ASSOCIATE PROFESSORS EMERITI Erwin J. Landon, Peter W. Reed

ASSOCIATE PROFESSORS Joseph A. Awad, Richard M. Breyer, Igor Feoktistov, William A.
Hewlett, Bjorn Knollmann, Patricia Labosky, Craig Lindsley, Michael J. McLean, John J.

Murray, Katherine T. Murray, Sandra Rosenthal, Bih-Hwa Shieh, Brian E. Wadzinski

RESEARCH ASSOCIATE PROFESSORS Olivier Boutaud, C. David Weaver

ADJUNCT ASSOCIATE PROFESSORS Sanika Chirwa, Darryl B. Hood

ASSISTANT PROFESSORS Christopher B. Brown, Chang Chung, Kevin Currie, Jerod Denton,
Florent Eleftheriou, Anthony C. Forster, Eugenia Gurevich, Maureen Hahn, Eva M. Harth,
Charles Hong, Tina M. Iverson, Sabina Kupersmidt, Gregory C. Mathews, BethAnn
McLaughlin, Jens Meiler, Paul Moore, Satish Raj, Claus Schneider, Benjamin Spiller,
Gregg D. Stanwood, Xiangli Yang, Tao Peter Zhong

RESEARCH ASSISTANT PROFESSORS David Airey, Randy S. Barrett, Daniel Campbell, Lucia Carvelli, Songhai Chen, Sean Davies, Kathie Eagleson, Carrie K. Jones, Ginger L. Milne, Stephen Milne, Colleen M. Niswender, Aurea Pimenta, Anita Preininger, Christine Saunders, Zixiu Xiang, Huiyong Yin, Chong-Bin Zhu
 ADJUNCT ASSISTANT PROFESSOR Habibeh Khoshbouei
 INSTRUCTORS Alexandre Bonnin, Ana Carneiro, Dawn Matthies, Harish Prasad, Alice Rodriguez
 RESEARCH INSTRUCTORS Liping Du, Haifa Hallaq, Hideki Iwamoto, Sergey V ishnivetsky

DEGREE OFFERED: *Doctor of Philosophy*

✂ STUDENTS interested in pharmacology participate in the Interdisciplinary Graduate Program in the Biomedical Sciences (see Biomedical Sciences). The program of study provides a broad background in pharmacology and other biomedical disciplines, preparing the student for a career as a research investigator. Graduates have been highly successful in obtaining positions in medical schools, government research institutes, and the pharmaceutical industry.

Students in their first year complete a core of course work through the Interdisciplinary Graduate Program in the Biomedical Sciences. The second year of study is composed of required and elective courses in Pharmacology for a total of 33 hours of formal course work toward the Ph.D. degree (including the 16 hours in the first year IGP). Requirements vary regarding the amount and distribution of course work that must be taken in related fields, but substantial work is usually taken in such other areas as cell biology, biochemistry, molecular physiology, biophysics, and chemistry. Subsequent years focus upon research and specialized course work as directed by mentors in the Pharmacological Sciences Training Program. Fields of research include molecular and biochemical pharmacology; neuropharmacology; autonomic, cardiovascular, endocrine, and clinical pharmacology; and drug metabolism and toxicology. A research dissertation is required for the Ph.D. degree. A thesis-based master's degree is awarded only under special circumstances.

For more information, visit pharmacology.mc.vanderbilt.edu.

320. Targets, Systems, and Drug Action. Introduction to human physiology is integrated with the pathophysiology, pathological manifestations, and therapeutic interventions. Lectures and laboratories emphasize the molecular and cellular underpinnings of normal organ function and disease. Mechanisms of drug action are discussed in a systemic fashion and supported by guided readings on drug discovery and design. Paradigm shifting experiments will be discussed to illustrate clarity of thinking, how focused experimental strategies lead to discovery, and potential difficulties in interpretation of experimental results. FALL, SPRING. [1-7] Barnett, Brash.

322. Scientific Communication Skills. Techniques in effective oral communication of scientific research as well as practical experience in research and literature presentation and in the preparation of grant proposals. FALL. [1] Chung.

323. Advanced Neurophysiology. (Also listed as Molecular Physiology and Biophysics 323 and Neuroscience 324) Recent findings concerning the structure, function, and pharmacology of ion channels. Topics will include the relationship between amino acid sequence, protein subunit structure, and function of both voltage- and ligand-gated channels; the relationship

between channel structure and pharmacology; the interaction of drugs with channels and receptor/channel proteins, with special emphasis on the interaction of compounds with different functional channel states; indirect coupling between ion channels and neurotransmitter and hormone receptors. Classes will include both presentations by the instructors and discussion of recent publications by students. Prerequisite: consent of instructor. SPRING. [3] DeFelice.

324. Receptor Theory and Signal Transduction. Structure and function of cell-surface receptors and the molecular bases by which they activate cellular function. Topics include receptor identification; quantitation of simple and complex binding phenomena; molecular bases for receptor coupling to GTP-binding proteins; the structure and function of ligand-operated ion channels, receptor-tyrosine kinases and receptor-induced signal transduction cascades receptors as oncogenes and proto-oncogenes. SUMMER. [1–3] A. Brown.

325. Cardiovascular Pharmacology. Cardiovascular physiology and pharmacology from the molecular to the organismal level. Classic experimental studies, molecular studies, and clinical observations will be presented to demonstrate the power of interdisciplinary approaches in answering complex questions in biology. Students will have the opportunity to identify specific areas or pathophysiologic states for emphasis. Topics covered: development of the cardiovascular system, regulation of cardiac contractility and electrophysiology, blood pressure regulation, coagulation, and select cardiovascular pathophysiologies. SPRING of ODD YEARS ONLY. [2] Barnett.

327. Modern Drug Discovery. The course will provide an introduction and overview to the drug discovery process. Focus will be on target selection, target validation, and the process of discovery early drug leads and optimization of those leads into compounds suitable for clinical development. This will include approaches used to transition from discovery to the early clinical development phase of a program as well as medical and market considerations that impact launching and progress of a drug discovery program. FALL. [2] Conn.

329. Pharmacology of Psychotropic Drugs and Drug Abuse. (Also listed as Neuroscience 329) An advanced course that focuses on the mechanism of action of CNS-active drugs, with extensive literature reading and student presentations. Prerequisite: 320, 345, or consent of instructor. SPRING. [2] Sanders-Bush.

345. Cellular and Molecular Neuroscience. (Also listed as Cell and Developmental Biology 345, Molecular Physiology and Biophysics 345, Neuroscience 345) This course is a required entry-level course for students in the Cell and Molecular Track of the Neuroscience Graduate Program at Vanderbilt that should be taken in the first graduate school year. It also serves as an elective for medical students and graduate students in a number of other programs. Its goal is to expose students to fundamental concepts and techniques in molecular and cellular neuroscience and provide a theoretical context for experimental analysis of brain function and disease. The course is divided into three modules. *Module I: Neural Anatomy and Development* provides an overview of the anatomy of the nervous system and neurotransmitters and examines concepts in neural pattern formation, neuronal migration, axon guidance, and synapse formation. *Module II: Signaling, Plasticity, and Modulation* reviews biophysical and molecular concepts relating to neuronal membrane excitability, secretion, and plasticity. *Module III: Neural Diseases and Disease Models* focuses on specific brain disorders such as epilepsy, pain disorders, Alzheimer's disease, depression, and schizophrenia and current models used to investigate their origin and/or treatment. This course combines faculty lecture with discussion of original articles, with an emphasis on fundamental concepts and the elucidation of important research paradigms in the discipline. Faculty and assistants guide students through important research paradigms with a critical analysis of the primary literature in the topic area. Prerequisite: Bioregulation I (IGP 300A) or consent of instructor. Course

directors may consider undergraduate course work in cell biology or biochemistry to meet this requirement. SPRING. [4] Currie, Carter, and Staff.

346. Molecular Neurobiology. (Also listed as Neuroscience 346) This course examines molecular components and interactions that regulate neuronal development, signaling, and disease. Topics include development of neuronal identity, axonal transport, growth factors and cell death, axon guidance and synapse formation, electrical and chemical transmission, regulation of neuronal excitability and genetic analysis of signaling and neural disorders. The course features didactic and literature discussions to introduce and cover key molecular mechanisms. Prerequisite: 345, Pharmacology 320, undergraduate course in neurobiology, or consent of instructor. SPRING. [3] Emeson, Staff.

348. Contemporary Issues in Behavioral Neuroscience. (Also listed as Neuroscience 348) This course explores recent findings in neuroethology and behavioral neurobiology through presentation and discussion of current research. Topics may include: animal communication; prey capture and orientation; circadian rhythms; sensory systems; neural control of hunger and thirst; hormones and sexual behavior; emotion, reward, and addiction; synaptic plasticity, learning, and memory; and disorders of the nervous system. Methods used to link brain structure and function will be explored. SPRING. [2] McDonald.

350. Independent Study. Qualified students work with individual staff members in areas not covered in other available courses. Prerequisite: approval of staff member and department chair. FALL, SPRING, SUMMER. [Variable credit: 1–2, with total credit limited to 2 hours] Staff.

360. Current Issues in Pharmacology. Presentation of current advances, paradigm shifts, and problems in pharmacology with an emphasis on experimental approaches and their interpretation. Prerequisite: consent of instructor. SPRING. [Variable credit: 1–3] Staff.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

399. Ph.D. Dissertation Research.

Philosophy

CHAIR Jeffrey Tlumak

DIRECTOR OF GRADUATE STUDIES Robert Talisse

PROFESSORS EMERITI John J. Compton, Clement Dore, Robert R. Ehman, John F. Post, Donald W. Sherburne, Henry A. Teloh

PROFESSORS Lenn E. Goodman, Michael P. Hodges, John Lachs, Kelly Oliver, Lucius T. Outlaw Jr., Charles E. Scott, David Wood

ASSOCIATE PROFESSORS Mark J. Bliton, Idit Dobbs-Weinstein, Gregg M. Horowitz, José Medina, Robert Talisse, Jeffrey Tlumak

ASSISTANT PROFESSORS Lisa Guenther, Elizabeth Jelinek, Jonathan Neufeld

SENIOR LECTURERS Kevin Davis, Jennifer Holt, Russell McIntire, Martin Rapisarda, Susan Schoenbohm

DEGREES OFFERED: *Master of Arts, Doctor of Philosophy*

✎ EACH candidate for the master's degree must complete 24 hours of formal course work with a minor of at least 6 hours. The minor may

include courses from philosophy and other disciplines, and it must form a coherent whole. The master's degree usually requires submission of a thesis, but an optional non-thesis plan is available to students admitted to candidacy for the Ph.D.

Work for the Ph.D. degree is offered in the fields of aesthetics, epistemology, ethics, history of philosophy, continental philosophy, American philosophy, metaphysics, philosophy of mind, philosophy of language, philosophy of religion, philosophy of science, and political and social philosophy. Candidates must complete at least 47 hours of formal course work, including a minor of at least 12 hours. This work may include courses from Philosophy and other disciplines, and it must form a coherent whole.

Ability to use the philosophical literature in languages other than English is an important scholarly tool. Students are encouraged to read foreign language materials, and faculty members are encouraged to recommend them, during the regular program of course and seminar work. The language requirement is satisfied when a student completes an independent readings course (Philosophy 302, 303, 304) using materials in one foreign language, usually French, German, or Greek, or by making significant use of a foreign language in conjunction with a regular course offering. The department has special expertise in Arabic, Hebrew, and Latin, as well.

202. Formal Logic and Its Applications. A self-contained course designed to convey an understanding of the concepts of modern formal logic, to develop convenient techniques of formal reasoning, and to make some applications of them in one or more of the following: psychology, linguistics, structuralist studies, information and computer sciences, and the foundations of mathematics. Philosophy 102 is not required. FALL. [3] Talisse.

203. Advanced Asian Philosophy. Classical Asian philosophical texts. Historical development of practices and ideas; translation and interpretation issues; comparisons with European and other traditions of thought. FALL. [3] Schoenbohm.

210. Ancient Philosophy. An examination of the major Greek and Roman philosophers with emphasis on the works of Plato and Aristotle. FALL. [3] Jelinek.

211. Medieval Philosophy. Comparative study of key figures in Islamic, Jewish, and Christian philosophy as they struggle with the philosophy of logic, metaphysics, language, culture, politics, ethics, and nature. SPRING. [3] Goodman and Dobbs-Weinstein.

212. Modern Philosophy. An examination of the major philosophers of modern Europe from Descartes and Spinoza through Locke, Berkeley, Hume, and Kant. SPRING. [3] Tlumak.

213. Contemporary Philosophy. An examination of selected problems treated in recent philosophical literature such as meaning, perception, knowledge, truth, and freedom. Readings from the Anglo American analytical and the phenomenological traditions. SPRING. [3] Forry.

217. Metaphysics. Selected problems in metaphysics such as ultimate explanation, meaning of existence, time and eternity, freedom and determinism, and science and religion. FALL. [3] Tlumak.

218. Hellenistic and Late Ancient Philosophy. Philosophical ideas of Stoics, Cynics, Epicureans, skeptics, Peripatetics, Neoplatonists, and early monotheist thinkers such as Philo, Origen, and Philoponus. [3] (Not currently offered)

- 220. Immanuel Kant.** Kant's revolutionary critique of the foundations of human knowledge, moral obligation, and religious faith, with readings from his three *Critiques* and lesser works. [3] Lachs. (Not currently offered)
- 222. American Philosophy.** A study of the works of selected American philosophers from the colonial period to the present. FALL. [3] Hodges.
- 224. Existential Philosophy.** A study of two or three existential philosophers and selected problems which arise in relation to their thought. [3] Guenther. (Not currently offered)
- 226. Phenomenology.** Selected readings from such thinkers as Husserl, Sartre, and Merleau-Ponty on the structures of experience, the sources and limits of knowledge, mind, and body, interpersonal relations, and the meaning of freedom. [3] Guenther. (Not currently offered)
- 228. Nineteenth-Century Philosophy.** A study of selected themes and writings from nineteenth-century European philosophers. [3] Staff. (Not currently offered)
- 231. Philosophy of History.** Focus on alternative conceptions of time and history in Aristotle, Augustine, Kant, Hegel, Heidegger, and Benjamin. [3] Dobbs-W einstein. (Not currently offered)
- 234. Philosophy of Education.** Analysis of educational concepts. Educational implications of theories of knowledge and theories of the individual. Emphasis on higher education. SPRING. [3] Forry.
- 235. Gender and Sexuality.** Recent theories of the relation between sex, gender, and sexuality. Construction of gendered identities, and their relation to embodiment, gender politics, ethics, and epistemology. FALL. [3] Forry.
- 238. Contemporary Ethical Theory.** A study of theories about the cognitive foundations of ethical discourses. FALL. [3] Jaeger.
- 239. Moral Problems.** A discussion of specific moral problems such as the justification of abortion and euthanasia. Moral theories such as utilitarianism will be discussed, but the emphasis will be on their relevance to the solution of moral problems. SPRING. [3] Forry.
- 240. History of Aesthetics.** History of philosophy of art, aesthetic experience, creativity, criticism, and related concepts. FALL. [3] Horowitz.
- 241. Modernist Aesthetics.** Abstraction, non-traditional media, mixed media, new media, changes in artistic institutions, and the death of art. [3] Horowitz. (Not currently offered)
- 242. Philosophy of Religion.** A study of various problems concerning religious experiences; ideas about religion and divinity. SPRING. [3] Hodges.
- 243. Philosophy of Film.** Challenges posed by film forms to traditional aesthetics and the novel philosophical approaches created to deal with them. Topics include the nature of the film image, film and experiential time, cinematic genres, the problem of mass art, and feminist critiques of spectatorship. Weekly screenings. SPRING. [3] Horowitz.
- 244. Philosophy and the Natural Sciences.** Philosophical issues in the methodology, conceptual structure, patterns of explanation, historical development, cultural impact, and metaphysical and ethical implications of the natural sciences. Prerequisite: satisfaction of the basic science requirement. SPRING. [3] Jelinek.
- 245. Humanity, Evolution, and God.** The impact of the idea of evolution on our conception of personhood. Theistic and non-theistic approaches to philosophical anthropology, ethics and society, the theory of knowledge, the mind-body problem, and relations with the environment and other species. [3] Goodman. (Not currently offered)

- 246. Philosophy of Language.** Philosophical problems in the methodology of linguistics, relations between thought and language, theories of meaning and symbolism, the nature of metaphor, the philosophical implications of theories of language acquisition. FALL. [3] Medina.
- 247. Kierkegaard and Nietzsche.** A study of selected works. [3] Wood. (Not currently offered)
- 248. Philosophy and Literature.** Philosophical topics in novels or poetry. Examples include: meaning of life, linguistic meaning, good and evil, aesthetic value, and human freedom. SPRING. [3] Holt.
- 249. Philosophy of Music.** Music and meaning, language, emotion, expression, interpretation, performance, the body, and politics. No musical background is required. [3] Neufeld. (Not currently offered)
- 251. Topics in Aesthetics.** Philosophy of art and aesthetic theory. [3] Horowitz, Neufeld. (Not currently offered)
- 252. Political and Social Philosophy.** A study of selected social and political theories. Critical analysis of the relevant works of Hegel, Marx, Lenin, Mill, Nietzsche, Gentile, and others. FALL. [3] Talisse.
- 253. Philosophy and Economic Policies.** A study of individual freedom, property rights, and welfare in their implications for a free market, private ownership of means of production, taxation, and expenditure for public goods. Readings from selected philosophers and economists—e.g., Locke, Hegel, Rawls, Nozick, Marx, Hayek, Friedman, Galbraith. [3] Staff. (Not currently offered)
- 254. Modern Philosophies of Law.** Contemporary theories of legal validity, legal liability (criminal and civil), and contractual obligation with special attention to the controversy between legal positivism and “natural law” theories and the assessment of contemporary economic analyses of legal rights. FALL. [3] Davis.
- 256. Philosophy of Mind.** Selected problems in the philosophy of mind; relationship between mind and body, the nature of consciousness, the problem of other minds, the status of self-knowledge, and the possibility of machine and other intelligence. Connections with empirical investigations in related cognitive disciplines. FALL. [3] Medina.
- 257. Early Modern Political Philosophy.** [3] Dobbs-Weinstein. (Not currently offered)
- 258. Contemporary Political Philosophy.** The emergence of post-liberal political thought. Topics include the politics of recognition, the specificity of political action, transformations in political theory as a consequence of gender, race, and environmental issues. These will be studied through examination of the writings of Hannah Arendt, Cornelius Casoridi, Heidegger, Derrida, Habermas, etc. SPRING. [3] Talisse.
- 260. Twentieth-Century Continental Philosophy.** A study of selected twentieth-century philosophers such as Derrida, Foucault, and Lacan. SPRING. [3] Wood.
- 261. Jewish Philosophy.** Introduction to Jewish philosophy and the philosophical achievement of such major figures as Philo, Saadia, Maimonides, Levinas, and selected contemporary thinkers. Goodman. (Not currently offered)
- 262. Islamic Philosophy.** Introduction to the major figures of Islamic philosophy including Kindi, Razi, Farabi, Avicenna, and Ibn Khaldun. FALL. [3] Goodman.
- 263. French Feminism.** Introduction to the tradition of French feminist philosophy, including relevant works by Beauvoir, Cixous, Irigaray, Kristeva, LeDoeuff, Kofmann, and others. [3] Staff. (Not currently offered)

270. Ethics and Medicine. Selected ethical issues raised by clinical practice, medical theories, and biomedical research and technology. Prerequisite: 105. SPRING. [3] Bliton.

271. Ethics and Business. Moral problems in the business world including irresponsible marketing, conflict between profit and social conscience, resource use, public regulation of business, and the value of competition. Prerequisite: 105. [3] Lachs. (Not currently offered)

272. Ethics and Law. Moral problems in the practice of law including conflicts of interest, confidentiality, limits of advocacy, and the obligations of lawyers to clients, courts, and the public. Prerequisite: 105. SPRING. [3] Davis.

273. Environmental Philosophy. Environmental ethics (animal rights, respect for nature, the land ethic), science and the natural world, the aesthetics of nature, global justice, and sustainability. FALL. [3] Forry.

294a–294b. Selected Topics. Topics of special interest, as announced in the *Schedule of Courses*. Students may enroll in more than one section per semester. FALL, SPRING. McGill Seminar, SPRING. [Credit: 3 each seminar, not to exceed 12 over a four-semester period] Staff.

301. Teaching and Research Methods. Survey of methods of research in philosophy and examination and discussion of teaching methods. Required of all first-year graduate students. FALL. [2] Staff.

302. Philosophical Readings in French. Selected major philosophical works or a selected bibliography about a major philosophical problem, read in French. A translation examination and appropriate reports. Completion with a *B* or better satisfies the department's language requirement. Prerequisite: four college semesters of French or equivalent; or a 550 or better score on the GSFLT in French. FALL, SPRING. [3] Staff.

303. Philosophical Readings in German. Selected major philosophical works or a selected bibliography on a major philosophical problem. A translation examination and appropriate reports. Completion of this course with a grade of *B* or better satisfies the department's language requirement. Prerequisite: four college semesters of German or equivalent; or a 550 or better score on the GSFLT in German. FALL, SPRING. [3] Staff.

304. Philosophical Readings in Classical Languages (Latin or Greek). The reading in Latin or Greek of selected major philosophical works or a selected bibliography on a major philosophical problem. A translation examination and appropriate reports. Completion of this course with the grade *B* or better satisfies the department's language requirement. Prerequisite: four college semesters of the appropriate language or equivalent. FALL, SPRING. [3] Staff.

350. Readings in Philosophy. Selected major philosophical works or a selected bibliography about a major philosophical problem. Appropriate reports and examination. FALL. [3] Staff.

351. History of Philosophy. Survey of figures and/or topics in history of philosophy. FALL, SPRING. [3] Staff.

352. Topics in Philosophy. Survey of topics in philosophy. FALL, SPRING. [3] Staff.

353. Figures in Philosophy. Survey of figures in the history of philosophy. FALL, SPRING. [3] Staff.

369. Master's Thesis Research. [0]

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

399. Ph.D. Dissertation Research.

Physics and Astronomy

CHAIR Robert J. Scherrer

DIRECTOR OF GRADUATE STUDIES Richard F. Haglund Jr.

PROFESSORS EMERITI Royal G. Albridge, John Paul Barach, Frank E. Carroll Jr.,
Douglas S. Hall, Arnold M. Heiser, E. A. Jones, P. Galen Lenhert, C. E. Roos,
Medford S. Webster

PROFESSORS Charles A. Brau, Charles W. Coffey, Louis J. DeFelice, David J. Ernst,
Leonard C. Feldman, Daniel M. Fleetwood, John C. Gore, Senta V. Greene,
Richard F. Haglund Jr., Dennis G. Hall, Joseph H. Hamilton, Thomas W. Kephart,
Charles F. Maguire, Volker E. Oberacker, Sokrates Pantelides, James A. Patton,
David W. Piston, Ronald R. Price, Akunuri V. Ramayya, Robert J. Scherrer, Paul D. Sheldon,
Norman H. Tolk, A. Sait Umar, Thomas J. Weiler, David A. Weintraub, Robert A. Weller,
John P. Wikswo Jr.

DISTINGUISHED RESEARCH PROFESSOR C. Robert O'Dell

RESEARCH PROFESSORS Aaron B. Brill, C. Richard Chappell, Medford S. Webster

ASSOCIATE PROFESSORS Steven E. Csorna, Will E. Johns, Sandra J. Rosenthal, Keivan G.
Stassun, Julia Velkovska

RESEARCH ASSOCIATE PROFESSORS Anthony B. Hmelo, Marcus H. Mendenhall,
Mark P. Oxley

ASSISTANT PROFESSORS Franz Baudenbacher, Andreas Berlind, James Dickerson,
George Ding, Dennis Michael Duggan, Daniel F. Gochberg, Kelly Holley-Bockelmann,
M. Shane Hutson, Robert Knop, Michael G. Stabin, Kalman Varga, Sharon Weiss

RESEARCH ASSISTANT PROFESSORS Heather Andrews, Iskander Batyrev,
Leonard Alan Bradshaw, Bibo Feng, William E. Gabella, Juan-Carlos Idrobo,
Kenneth E. Schriver, Alan Tackett, Leonidas Tsetseris, Momchil Velkovsky

DEGREES OFFERED:

PHYSICS. *Master of Arts, Master of Arts in Teaching, Master of Science,
Doctor of Philosophy*

ASTRONOMY. *Master of Science*

✦ AS fundamental sciences, physics and astronomy are driving intellectual forces in expanding our understanding of the universe, in discovering the science that underlies new technologies, and in applying these technologies to curiosity-driven and applied research. In keeping with this role, the Department of Physics and Astronomy has active research groups studying the physics of elementary particles; nuclear structure and heavy-ion reactions; linear and nonlinear interactions of photons, electrons, atoms, and molecules with nanocrystals, surfaces, and interfaces; the electric and magnetic properties of living systems; the structure and dynamics of biopolymers; computational physics; unusual, low-mass and young stars, extrasolar planets and star clusters; and cosmology.

The Master of Science degree in physics requires a minimum of 24 credit hours of formal course work, of which at least 9 must be in course work above the 300 level. Students in the physics master's degree program usually submit a thesis; however, a non-thesis option (Master of Arts in physics) is available to students admitted to candidacy for the

Ph.D. in physics. Under the non-thesis plan, the student presents an oral report on a research subject in the field of investigation and submits a written account of this subject to the program faculty. A master's degree in physics with emphasis in health physics is also available. For information regarding the Master of Science degree in medical physics, see the medical physics section in the School of Medicine catalog.

The Ph.D. degree requires 72 hours of graduate work, including 18 hours of core courses, the 1 hour Physics 300 seminar, 12 hours of non-core physics graduate courses, and 5 hours of elective courses. The remaining credit hours may be earned through some combination of dissertation research and approved lecture courses.

The Master of Science degree in astronomy requires a minimum of 24 credit hours, of which 12 are to be chosen from the astronomy course offerings. The M.S. program in astronomy normally requires four semesters and includes an oral examination.

Physics

221. Classical and Modern Optics. Geometrical optics: reflection, refraction, ray tracing, aberrations, interference. Physical optics: wave theory, absorption, dispersion, diffraction, polarization. Properties of light from lasers and synchrotron sources; photodetectors; optical technology. No credit for graduate students in physics. SPRING. [3] Dickerson.

223. Thermal and Statistical Physics. Temperature, work, heat, and the first law of thermodynamics. Entropy and the second law of thermodynamics. Kinetic theory of gases with applications to ideal gases and electromagnetic radiation. FALL. [3] Tolks.

225W–226W. Introduction to Quantum Physics and Applications. A survey of modern physics using elementary quantum mechanics. 225W: Atomic and molecular structure and spectroscopy. Solid state physics. 226W: Nuclear structure decay and reactions. Properties and classifications of elementary particles. Accompanied by a weekly laboratory. Recommended: Mathematics 198. FALL, SPRING. [4–4] Haglund, Maguire, Johns [Laboratory].

227a–227b. Intermediate Classical Mechanics. 227a: Vector algebra and coordinate transformations; orbital and rotational angular momentum; gravitational and Coulomb central-force problems; free, forced, damped and nonlinear harmonic oscillations; chaos in simple mechanical systems. 227b: Normal modes; rigid-body motion; special relativity; Lagrangian and Hamiltonian descriptions of classical mechanics; continuum mechanics. Prerequisite for 227a: Mathematics 170 or equivalent. Recommended corequisite for 227b: Mathematics 198. FALL, SPRING. [3–3] Brau, Sheldon.

229a–229b. Electricity, Magnetism, and Electrodynamics. 229a: Electrostatic fields and potentials; Gauss's law; electrical properties of insulators, semiconductors and metals; the Lorenz force; magnetic fields and forces; electromagnetic induction, Maxwell's equations and electromagnetic waves. 229b: Electromagnetic waves in dielectrics and conductors; electromagnetic radiation in waveguide structures; relativistic electrodynamics; magnetism as a relativistic phenomenon. Prerequisite for 229a: three semesters of calculus; corequisite for 229b: differential equations. SPRING, FALL. [3–3] Ernst, Kephart.

239a–239b. Advanced Physics Laboratory. Laboratory work in more advanced techniques or design and construction of new physics teaching experiments. Prerequisite: 225a–225b. [Variable credit: 1–3 each semester, variable total credit 3–6] (Not currently offered)

240. Selected Topics. [Variable credit: 1–3 each semester]

245. Computational Physics. Programming techniques in physics suitable for personal computers: classical scattering, one-dimensional barrier tunneling, Laplace's equation, static and time-dependent Schrödinger's equation, hydrodynamics, and diffusion. Recommended: Computer Science 120. FALL. [3] Maguire

251a–251b. Introductory Quantum Mechanics. Wave-particle duality, indeterminacy, superposition, the Schrödinger equation, angular momentum and scattering, perturbation theory. Prerequisite: 225a and 227a. Recommended: differential equations. FALL. [3–3] Csorna, Haglund.

254. Physics of Condensed Matter. Crystal structure and diffraction; phonons and lattice vibrations; free-electron theory of metals; elementary band theory of solids; semiconductors; optical properties of insulators; and applications to solid-state devices, magnetism, and superconductivity. Prerequisite: 223, 225a, and 227b. SPRING. [3] Tolk.

255. Introduction to Particle Physics. Weak, strong, and electromagnetic forces as evidenced by the interactions of elementary particles. Classification of particles and experimental techniques. [3] Sheldon. (Not currently offered)

257. Computational Physics. Topics in modern physics that can be effectively analyzed only with the use of programming tools. Three-body solar system orbits, random walk diffusion and entropy growth, magnetism in the second-order Ising model, non-equilibrium molecular dynamics, and solutions to the Schrödinger equation using numerical methods. Prerequisite: CS 101 or CS 103 or familiarity with commercial mathematical applications (Mathematica, Mathcad, or even Excel). FALL. [3] Maguire.

258. Physics of Magnetism. Magnetism in condensed matter; properties of isolated and interacting magnetic moments; exchange interactions and spin wave excitations; giant and colossal magnetoresistance; application to magnetic memory and spintronics. [3] (Not currently offered)

274. Principles and Applications of BioMicroElectroMechanical Systems. Principles, design, fabrication, and application of micro- and nano-devices to instrument and control of biological molecules, living cells, and small organisms. Development of micro-fabricated systems, lab-on-a-chip, and micro- and nano-biosensors. Topical discussions from the research literature. [3] Staff. (Not currently offered)

300. Seminar. FALL. [1] Scherrer.

302. Learning to Teach, Teaching to Learn. Directed readings and discussion of topics in the teaching of science and engineering. Practical application of best teaching practices will be emphasized. Intended primarily for first-time teaching assistants and first-year graduate students. FALL. [1] Stassun.

303. Experimental Nuclear Physics. Interactions of charged particles and photons in matter, coordinate transformations, statistics of nuclear processes, radiation detectors and analyzers, and selected topics in the design and application to experiments of particle accelerators and instrumentation used in nuclear and high energy physics. Recommended concomitant: 225b. [3] (Not currently offered)

305. Particle and Continuum Mechanics. Least action principle, Lagrange formalism, conservation laws, two-body problem, small-amplitude vibrations, non-inertial reference frames, canonical formalism, rigid body motion, continuous media, and field theory. Includes programming on scientific work stations. Prerequisite: 227a and Math 261a; corequisite: Math 262a. FALL. [3] Varga.

306. Biomolecular Physics. Physical principles applied to the structure and dynamics of biological molecules on the nanometer scale. Emphasis on the random Brownian motion that dominates at all length scales, and how bimolecular structures move, function, and

interact amid chaotic thermal fluctuations. Selected measurement techniques. Prerequisite: one year of calculus and one year of physics. [3] (Not currently offered)

308. Mathematical Methods for Physicists. Linear spaces and operators, matrix algebra, vector and tensor fields, differential equations and special functions, Green's function, complex analysis; may include variational calculus, perturbation methods, group theory. FALL. [3] Umar.

325. Physical Measurements on Biological Systems. (Also listed as Biomedical Engineering 325) A survey of the state of the art in quantitative physical measurement techniques applied to cellular or molecular physiology. Topics include the basis for generation, measurement, and control of the transmembrane potential; electrochemical instrumentation; optical spectroscopy and imaging; X-ray diffraction for determination of macromolecular structure; magnetic resonance spectroscopy and imaging. One lecture and one recitation. Prerequisite: modern physics course or consent of instructor. [3] Hutson.

329a–329b. Advanced Electrodynamics. 329a: Electrostatics, potentials, boundary value problems, multipole moments, polarization, magnetostatics, Maxwell's equations, electromagnetic wave propagation, dissipative and conductive media. 329b: covariant formulation, least-action principle and Lagrange density, energy momentum tensor, charges in external fields, radiation from accelerated charges, multipole radiation. Prerequisite: 229a–229b, Mathematics 262. 329a: SPRING. [3] Umar. 329b: FALL. [3] Oberacker.

330a–330b. Quantum Mechanics. Wave and matrix formalisms of the theory, transformation theory, theory of angular momentum, systems of indistinguishable particles, approximate methods of solution, energy levels and scattering processes, and introduction to relativistic quantum mechanics. Prerequisite: 251, Math 262. [3–3] Ernst, Oberacker.

333a–333b–333c–333d. Theoretical Physics Seminar. Topics such as theoretical nuclear astrophysics, principles of mathematical physics, quantum theory of finite systems, exotic nuclei near the proton/neutron driplines. Prerequisite: 330a. [1–1–1–1] (Not currently offered)

340a–340b. Nuclear and Heavy-Ion Theory. Phenomenological models (liquid drop, collective and shell models), nucleon-nucleon interaction, microscopic theories of nuclear structure (Hartree-Fock, RPA, interacting boson approximation), heavy-ion reactions below 20 MeV/A (TDHF theory), nuclear physics at intermediate and high energies (quarks in nuclei, quark-gluon plasma formation). Prerequisite: 330a. [3–3] (Not currently offered)

341. Statistical Mechanics. Phase space, entropy and reversibility; ensemble theory; Fermi and Bose Statistics; systems of interacting particles; equation of state, critical phenomena, and phase transitions; pairing and superfluidity. SPRING. [3] Hutson.

343. High-Performance Computing for Scientists and Engineers. Introduction to high-performance computing focusing on speedup of science and engineering applications. The course will utilize Vanderbilt's research cluster maintained by the Advanced Computing Center for Research and Education. Students will be expected to complete a class project that introduces some features of high-performance computing to their thesis research. SPRING. [3] Walker, Tackett.

350. Selected Topics in Theoretical Physics.

— Physics of biological pattern formation. Physical principles of developmental biology. Viscoelastic mechanics; differential cell adhesion; gene regulatory networks as dynamical systems; self-organization; and activator-inhibitor systems. Prerequisite: PHYS 117a–b, BSCI 110a–b. FALL. [3] Hutson.

— Lie groups and symmetry principles in quantum mechanics, quantum electrodynamics of strong fields, phenomenological models of nuclear structure. Prerequisite: consent of instructor. SPRING. [3] Kephart.

351a–351b–351c–351d. Topics in the Physics of Elementary Particles. A single topic reflecting current faculty interest each semester. [1–1–1–1] (Not currently offered)

352a–352b–352c–352d. Special Topics in Experimental Physics. Current topics in experimental physics relevant to research areas in the department, such as biological, condensed-matter, elementary-particle, nuclear, and optical physics, astronomy, astrophysics and cosmology. FALL, SPRING. [Variable credit: 1–3] Wikswo.

354. Condensed Matter Theory. Free-electron theory of metals; elementary band theory of solids; quantum theory of the harmonic crystal; elementary excitations; optical properties of materials; electronic basis of magnetic interactions; density-functional theory; relativistic band structure; electronic localization and amorphous solids; two-dimensional phase transitions and superlattices. Prerequisite: Physics 330 or consent of instructor. SPRING. [3] Pantelides.

356. Biophysical Electrodynamics. The physics of bioelectric phenomena: the mechanisms that lead to the transmembrane resting and action potentials in nerve and muscle cells, the differential equations describing propagation of the nerve action potential, and the relationship between the transmembrane and extracellular potentials in nerve and cardiac muscle. [3] (Not currently offered)

357a–357b. Atomic and Molecular Physics. Quantum mechanical treatment of atomic and molecular structure and dynamics, including binding, transitions, radiative transfer processes, and dynamics of elastic and inelastic scattering of electron-atom and atom-atom systems. Prerequisite: 330a–330b. [3–3] (Not currently offered)

358b. Interaction of Light with Matter Interaction of electromagnetic radiation with atoms, molecules, and solids. Optical pumping, rate equation treatment of laser action; nonlinear interactions of light with matter, including multiphoton processes, harmonic generation and stimulated scattering; and the behavior of atoms and molecules in intense photon fields. [3] (Not currently offered)

359a. Surface Structure and Dynamics. Geometrical and electronic structure of surfaces, including surface reconstruction, density of states, and effects of adsorbates, impurities, and electronic defects. Prerequisite: 330a–330b. [3] (Not currently offered)

360a–360b. General Relativity and Cosmology . Einstein's geometric theory of gravity in terms of tensor analysis and differential geometry. Einstein's field equations are derived and solutions are discussed. Applications of general relativity are explored, including those to very strong gravitational fields, gravitational collapse, neutron stars, black holes, and quantum gravity. Topics in cosmology will include red shifts and cosmic distance relations, big bang cosmology, primordial nucleosynthesis, the very early universe and inflationary cosmologies. Prerequisite: consent of instructor. [3–3] Weiler. (Offered alternating years)

361. Nonlinear Dynamics and Chaos. Qualitative and quantitative solutions to nonlinear ordinary differential equations; analytical and numerical techniques; conditions for stable solutions, onset of instability, and chaotic phenomena; connection between classical and quantum nonlinear systems; textbook presentation and selected applications from current research literature. Prerequisite: 305. [3] (Not currently offered)

365. Many-Particle Quantum Theory . Nonrelativistic theory of atoms, solids, and nuclei; operators in second quantization, fermions and bosons, pair correlation function, interacting electron gas (metal), propagators, Wick's theorem and Feynman diagrams, Hartree-Fock theory, shell model, pairing for ces in nuclei, and superconductivity. Prerequisite: 330b. [3] (Not currently offered)

369. Master's Thesis Research.

370a. Quantum Field Theory. Relativistic quantum mechanics, canonical and path-integral field quantization, relativistic scattering theory, perturbation expansions; Feynman diagrams and radiative corrections, renormalization and regularization, with applications to quantum electrodynamics and non Abelian gauge theories. Prerequisite: 305, 329a–329b, 330a–330b. SPRING. [3] Velkovsky. (Offered alternating years)

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

390a–390b. Independent Study. [Variable credit: 1–3 each semester] Staff.

399. Ph.D. Dissertation Research.

3995. Half-time Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

Medical and Health Physics

224. Physical Analysis of Biological Systems. Applications of physics to human biology, including biomechanics, exponential growth and decay, statistical mechanics and mass transport, bioelectricity and biomagnetism. Prerequisite: one year of calculus. Course in biology recommended. [3] (Not currently offered)

228. Physics of Medical Imaging. Applications of physics to medicine, including signal analysis, image processing, atoms and light, X-rays, nuclear medicine, and magnetic resonance imaging. Prerequisite: one year of calculus. FALL. [3] Yankeelov.

243. Health Physics. Theory and instrumentation in health physics and radiological physics. Radiation shielding design, methods of external and internal dosimetry, and radiation regulatory issues. Prerequisite: 153 or 225a and one year of calculus. FALL. [3] Stabin.

248. Radiation Biophysics. Response of mammalian cells and systems to ionizing radiation. Acute radiation syndromes, carcinogenesis, genetic effects, and radiobiological basis of radiotherapy. Prerequisite: 228 and Biological Sciences 110a. FALL. [2] Freeman.

262. Medical Imaging, Lasers and Energy-Tissue Interactions. Survey of medical technologies, including X-ray, ultrasound, C-T scan, MRI, radiation therapy, and laser medicine and surgery. Each technology will be presented in terms of the fundamental physics and scientific discovery, research and development, and the application to medical care. The historical, sociological, economic, and ethical impacts of the medical technology will be addressed. Prerequisite: one year of calculus-based physics and Biological Sciences 110a–110b. [3] Staff. (Not currently offered)

285. Radiation Detectors and Measurements. Basic physics principles and applications of radiation detecting instruments, with laboratory exercises. Techniques and instrumentation for nuclear radiation detection and measurements as they relate to health physics (radiation safety) and nuclear physics. SPRING. [4] Stabin.

301a. Medical Physics Seminar. Radiotherapy treatment techniques and current methodologies in clinical therapy physics. Prerequisite: 228. [1] Staff.

301b. Medical Physics Seminar. Topics in medical imaging, techniques and applications. Prerequisite: 228. [1] Staff.

304. Radiation Interactions and Dosimetry. Theory and instrumentation of ionization measurements of high-energy photon and electron beams. Methods of radiation absorbed dose

calculations for photons, k neutrons and charged particles in matter. Prerequisite: 228, 243 and differential equations. SPRING. [3] Duggan.

307. Radiation Dose Assessment. Description of models and methods for internal and external dose assessment. Historical and modern methods for calculating radiation dose, and will gain proficiency in their use by working examples and applying the principles to project analyses. Prerequisite: 243, 304. [3] Stabin. (Not currently offered)

311. Clinical Therapy Physics I. Instrumentation and application of physics to clinical radiotherapy procedures, equations for absorbed dose calculations, phantoms, methodologies in computerized treatment planning, introduction to the special techniques of brachytherapy and stereoradiosurgery. Prerequisite: 228 and 304. FALL. [3] Coffey (Radiology and Radiological Sciences) and Duggan (Radiology and Radiological Sciences).

312. Clinical Therapy Physics II. Photon and electron beam algorithms for dosimetry calculations. Methodologies in three-dimensional treatment planning with specific applications to radiotherapy. Prerequisite: 311 and differential equations. SPRING. [2] Duggan (Radiology and Radiological Sciences).

313. Clinical Diagnostic Physics. Instrumentation and application of physics to clinical diagnostic imaging procedures including: radiographic and fluoroscopic X-ray, CT, MRI, nuclear medicine, and ultrasound. Prerequisite: 228 and 304. FALL. [3] Patton (Radiology and Radiological Sciences) and Pickens (Radiology and Radiological Sciences).

314. Laboratory in Clinical Therapy Physics. Applications of physics to clinical radiotherapy procedures, experience with equipment in a modern clinical radiotherapy environment, methodology and techniques for the verifications of simulated clinical procedures. Prerequisite: 228 and 311. SPRING. [2] Coffey (Radiology and Radiological Sciences) and Duggan (Radiology and Radiological Sciences).

315. Laboratory in Clinical Diagnostics Physics. Applications of principles, techniques, and equipment used in radiographic and fluoroscopic X-ray, CT, MRI, nuclear medicine, and ultrasound imaging. Prerequisite: 228 and 313. SPRING. [2] Price (Radiology and Radiological Sciences) and Riddle (Radiology and Radiological Sciences).

391a. Medical Physics Practicum: Therapy . Radiotherapy physics in a clinical setting. Treatment planning instrumentation calibration, quality assurance. Radiotherapy patient interaction, clinical conference attendance, and review of treatment techniques in radiation oncology. Prerequisite: 311, 312, and 314. [6] Coffey.

391b. Medical Physics Practicum: Diagnostic. Diagnostic physics in a clinical setting. Instrumentation methodology, calibration, quality assurance. Diagnostic radiology patient interaction, clinical conference attendance, and review of imaging techniques in radiology. Prerequisite: 313 and 315. [6] Staff.

Astronomy

205. Principles of Astrophysics. Origin and evolution of matter. The tools and methods of astrophysics, including light and telescopes; cosmology and the Big Bang; galaxies and star formation; physics of stars, including nucleosynthesis and stellar death; the solar system and the search for other worlds. No credit for students who have completed 102. Prerequisite: Physics 116a or 117a, or 121a and one semester of college calculus. [3] (Not currently offered)

222. Observational Astronomy. Principles and techniques including astrometry, photographic and photoelectric photometry, spectral classification, and radial velocity measurements.

Scheduled evening sessions at Dyer Observatory. Prerequisite: 102 or 175; Physics 225a. [3] Stassun. (Not currently offered)

223. Binary Stars. Visual, eclipsing, and spectroscopic binaries; techniques for solving their orbits. Extended atmospheres, circumstellar matter, mass transfer, X-ray and radio emission, and orbital period changes in binaries. Evolution of close binaries. Prerequisite: 102. [3] (Not currently offered)

252. Stellar Astrophysics. Absorption and emission of radiation by the sun and stars. Principles of stellar structure and stellar evolution from formation to death. Prerequisite: Physics 223 and 225a; Mathematics 198. FALL. [3] Berlind.

253. Galactic Astrophysics. Interstellar matter and gaseous nebulae, the structure and evolution of normal galaxies, active galactic nuclei and quasars, and observational cosmology. Prerequisite: Physics 225a, Mathematics 198. SPRING. [3] Holley-Bockelmann.

260. Introductory General Relativity and Cosmology. Introduction to Einstein's theory which describes gravity as a curvature of spacetime. Tensor analysis, special relativity, differential geometry, spacetime curvature, the Einstein field equations, the Schwarzschild metric for stars and black holes, and the Friedmann-Robertson-Walker metric for cosmology. Designed for undergraduates in the Department of Physics and Astronomy; graduate students should take Physics 360a–360b. Prerequisite: Physics 227a, 229a. Recommended: Physics 227b. [3] (Not currently offered)

300a–300b. Astronomy Seminar. [1–1] Stassun. (Not currently offered)

307a–307c–307d. Selected Topics in Astrophysics. Stellar atmospheres, stellar interiors, interstellar matter, binaries, variable stars, solar system physics, and galaxies. Prerequisite: consent of instructor. [3–3–3] Staff. (Not currently offered)

310. Radiative Processes. Electromagnetic radiation from astrophysical sources. Radiative transfer; blackbody radiation; atomic and molecular absorption and emission; radiation from moving charges; relativistic beaming. Bremsstrahlung; synchrotron radiation; Compton scattering. Prerequisite: Physics 229a–229b, Physics 251a–251b. SPRING. [3] Staff.

311. Nebular Astrophysics. Astrophysics of diffuse nebulae and interstellar gas; photoionization, thermal equilibrium, dynamics. Interstellar medium, dust, planetary nebulae, supernova remnants, HII and star forming regions, and active galactic nuclei. Prerequisite: Physics 229b. [3] Knop. (Not currently offered)

322. Methods in Observational and Computational Astronomy. Principles and techniques including accurate measurement of astronomical distance, data handling and error analysis, computer programming. Four to six experiments such as determination of Earth's radius, distance to the Moon, refraction by the atmosphere, distance to a star cluster. Scheduled evening sessions at Vanderbilt Dyer Observatory. Prerequisite: one year of calculus-based physics. FALL. [3] Stassun.

352. Stellar Astrophysics. Physics of stellar structure and evolution, including nuclear energy generation, equations of state, and heat transfer by radiation, conduction, and convection. Numerical stellar models. Observational aspects of stellar astrophysics. FALL. [3] Berlind.

353. The Structure and Dynamics of Galaxies. The stellar, gaseous, and dark matter content of galaxies; their internal bulk properties, structure, kinematics, and dynamics. Equilibrium and stability of stellar systems. Orbit theory, the gravitational N-body problem, relaxation, dynamical friction, and the Fokker-Planck equation. Galaxy evolution from the standpoint of stellar populations, the initial mass function, chemical evolution, and galaxy interactions. SPRING. [3] Holley-Bockelmann.

354. Structure Formation in the Universe. Dark matter and dark energy. Growth of linear and nonlinear density fluctuations. Density and velocity fields, perturbation theory and nonlinear collapse models. Cosmological N-body simulations and the formation of dark matter halos. Galaxy clustering measurements and galaxy formation physics. The physics behind experimental cosmological probes of dark matter and dark energy. Prerequisite: none. SPRING. [3] Berlind.

355. Order-of-Magnitude Astrophysics. Starting from basic physical principles, students will learn to make order-of-magnitude estimates on a wide variety of astrophysical problems. Class centers around the students working through problems together, moderated by the instructor. Course can be taken multiple times to develop problem-solving skills, physical intuition, and the ability to improvise. Prerequisite: none. FALL, SPRING. [1] Staff.

369. Master's Thesis Research.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

Political Science

ACTING CHAIR John G. Geer

DIRECTOR OF GRADUATE STUDIES Jonathan T. Hiskey

PROFESSORS EMERITI Robert H. Birkby, Alex N. Dragnich, Erwin C. Hargrove,
William C. Havard Jr., Richard A. Pride, Harry Howe Ransom, Derek J. Waller,
Benjamin Walter

PROFESSORS William James Booth, John G. Geer, M. Donald Hancock, David E. Lewis,
Bruce I. Oppenheimer, James Lee Ray, Mitchell A. Seligson, Carol M. Swain, C. Neal Tate
ADJUNCT PROFESSORS Harold Ford Jr., Vaughn May, Robb McDaniel, Roy Neel,
Vin Weber

ASSOCIATE PROFESSORS Brooke A. Ackerly, Florence Faucher-King, Marc J. Hetherington,
Jonathan T. Hiskey, Cindy D. Kam

ASSISTANT PROFESSORS Carol Atkinson, Brett V. Benson, Katherine B. Carroll, Giacomo
Chiozza, Pamela C. Corley, Suzanne Globetti, Christian R. Grose, Monique L. Lyle,
Michaela Mattes, Efrén O. Pérez, Elizabeth J. Zechmeister

SENIOR LECTURER Klint J. Alexander

DEGREES OFFERED: *Master of Arts, Master of Arts in Teaching,
Doctor of Philosophy*

✦ THE master's degree in political science may be earned through (a) a program that requires 24 hours of course work (including Political Science 355 and 356 and at least 18 hours of 300-level courses) and a thesis or (b) a non-thesis option requiring 33 hours of course work (including Political Science 355 and 356 and at least 27 hours of 300-level courses) and a master's degree examination in the student's field of choice. A master's degree in passing option is available to students who have completed all courses required for the Ph.D. degree, passed the preliminary examinations, and defended successfully the dissertation proposal.

At least 48 hours of formal course work are required for the Ph.D. degree; 72 credit hours (including dissertation research hours) are required in total to complete the degree. Research Design (355) and Statistics for Political Research (356), required of all prospective candidates, are normally taken in the first year of residence.

Candidates for the Ph.D. are expected to demonstrate proficiency in research skills, including statistics, at a level fixed by the program faculty.

201. Contemporary Political Theory. Recent political philosophy. Democratic theory, multiculturalism, feminism, post-modernism. SPRING. [3] Ackerly.

202. History of Classical Political Philosophy. Intensive analysis of the principal political philosophers in the classical tradition. SPRING. [3] Staff.

203. Modern Political Philosophy. Intensive analysis of the principal political philosophers in the modern tradition. [3] (Not currently offered)

204. American Political Thought. An analytical study of American political theories and their impact upon our political institutions. FALL. [3] Staff.

205. Modern Political Ideologies. Analysis of the belief systems of selected political movements, groups, and societies; their relationship to political philosophy; and theories of political action. [3]

206. Foundations of Marxism. Intensive analysis of the political, philosophical, and economic theories of Karl Marx in the context of European philosophical and political traditions. Major critical interpretations of Marx will be stressed. [3]

207. Liberalism and Its Critics. Philosophical and political analysis of the utilitarianism of Mill and Bentham and the liberalism of Locke and Kant. Critiques by contemporary Libertarians and Communitarians. SPRING. [3] Ackerly.

208. Law, Politics, and Justice. Contemporary and classical theories of law and society; rights theories; gender and the law; law and transitions to democracy; law between nations. FALL. [3]

209. Issues in Political Theory. Topics vary from semester to semester. May be repeated once if there is no overlap with previous offerings. Prerequisite: 202, 203, 205, or 206. [3] (Not currently offered)

210. West European Politics. Analysis of political development, social forces, institutions, and public policy in Great Britain, France, Germany, Italy, and Sweden. FALL, SPRING. [3] Faucher-King, Hancock.

211. The European Union. Political and economic integration. Origins, institutions, decision processes, policies, achievements, and prospects of the European integration movement. FALL. [3] Hancock.

213. Democratization and Political Development. Comparative study of political development, with a focus on institutions. The effect of political choices about voting systems, executive and legislative powers, cabinet formation, and other institutions on political competition, parties and government stability. Cases from established democracies and countries undergoing democratization. No credit for students who have taken 317. SPRING. [3] Hiskey.

214. The Japanese Political System. Study of the government and politics of Japan, in the context of the interaction of traditional and modern elements in contemporary Japanese political style. [3] (Not currently offered)

- 215. Change in Developing Countries.** Comparative study of political and economic change in developing countries. Political implications of ethnicity, economic dependency, and environmental degradation. [3] (Not currently offered)
- 216. The Chinese Political System.** Governmental institutions and political processes in the People's Republic of China with emphasis upon the interaction of traditional and revolutionary elements. Some attention to Taiwan since 1950 and to the overseas Chinese as parts of the Chinese political universe. FALL. [3] Benson.
- 217. Latin American Politics.** Cross-national analysis of political institutions, cultures, and processes of change in Latin America. FALL. [3] Staff.
- 218. Social Reform and Revolution.** Reform and revolution as responses to social inequality. Causes and outcomes of reform and revolution in Europe and Latin America from the mid-nineteenth century to the present. [3] (Not currently offered)
- 219. Politics of Mexico.** A survey of contemporary Mexican politics from a comparative perspective. Interaction of economic, social, and political forces that led to the demise of one of the world's most durable one-party political regimes and the prolonged transition to democracy. SPRING. [3] Hiskey, Zechmeister.
- 220. Crisis Diplomacy.** Analysis of foreign policy decision making and strategy. Emphasis on differences between crises that lead to war and those that do not. Foreign relations of Britain, France, Germany, Russia, and Japan. SPRING. [3] Staff.
- 221. Causes of War.** Scientific study of the onset of expansion and consequences of war; conditions of peace, emphasizing alliances, arms races, and crisis escalation. FALL, SPRING. [3] Mattes.
- 222. American Foreign Policy.** Critical analysis of major international and domestic factors shaping U.S. foreign relations as reflected in selected twentieth-century experiences. FALL, SPRING. [3] Ray.
- 224. Theories of World Politics.** Analysis of major theories of the basic factors underlying global relations. [3] Ray.
- 225. International Political Economy.** Survey of major issues involving the interaction of political and economic forces at the global level. Particular attention to theories of interdependence and imperialism, the position of developing countries in the international system, multinational corporations, and the economic origins of war. FALL. [3] Alexander.
- 226. International Law and Organization.** The role of international law and international organizations in the contemporary global political system. Focus on the evolution and impact of international law as well as such organizations as the United Nations, the International Monetary Fund (IMF), and selected regional (as well as nongovernmental) organizations. FALL, SPRING. [3] Mattes, Alexander.
- 227. Economics and Foreign Policy.** Economic factors influencing foreign policy behavior, including economic factors, conditions, and motivations for conflictual and cooperative relations. Economic instruments used by governments to achieve policy goals: trade ties, economic sanctions, foreign aid. Economic theories of war and peace. FALL. [3] Staff.
- 228. International Politics of Latin America.** Examination of Latin America's role in the international and inter-American system. Special attention to the international response to revolutionary change in the area, and to the region's major actors and their changing relationship with the United States, with other major powers, and with other actors such as multinational corporations and international financial institutions. [3] Staff.

- 229. Strategy and International Politics.** Strategic behavior and strategic choices arising from interactive decision making within the context of inter national politics. General principles of strategy. In-class experiments and game playing. SPRING. [3] Benson.
- 231. Contemporary Issues in Eur ope.** Detailed analysis of the political, economic, and social issues facing Eur ope's post-Cold War period including regional integration, transitions to democracy, economic transformation, ethnic-national relations, industrial organization, environmental politics. [3] Hancock.
- 232. Evolution in French Foreign Policy Under the Fifth Republic.** Development of distinct French foreign policy; use of colonial experience in the North-South dialogue; France's place in the new international order. Offered at Vanderbilt in France. [3] (Not currently offered)
- 233. Social Movements in the Developed and Developing W orlds.** Comparative study of protest movements with emphasis on origins, activities, and impact of movements focusing on women, ethnic minorities, and the environment. [3] (Not currently offered)
- 234. Women, Politics, and the Development of the Thir d World.** Analysis of the special problems afflicting women in the developing world and examination of proposed strategies, domestic and international, for reform. [3] (Not currently offered)
- 238. Comparative Political Parties.** Political parties and their role in the democratic process of modern liberal western democracies, focusing on party systems and party organizations. SPRING. [3] Faucher-King.
- 239. Comparative Courts and Judicial Politics.** Introduction to the structure, function, political significance, and policy making of courts and the judges who staff them, especially outside the boundaries of the United States. No cr edit for students who have completed 288-01 or 288-04. [3] (Offered 2009/2010)
- 240. Political Parties.** Theories of party formation, organization, and behavior. Historical development of party systems. Criteria for the comparative evaluation of party systems. Parties as instruments of citizen contr ol. Implications for electoral outcomes, coalition formation, legislative decision-making, and public policy. FALL. [3] Oppenheimer.
- 241. American Public Opinion and Voting Behavior.** The development and dynamics of political opinion and its effects on voting and public policy. Models of political behavior. SPRING. [3] Staff.
- 242. Political Communication.** The relationship of government and the press. Theories of communication; mass media and sociopolitical change; political persuasion and propaganda; responsibilities of the press. SPRING. [3] Staff.
- 243. Political Campaigns and the Electoral Process.** Theories of representation and democratic accountability; electoral strategies and tactics, including political polling and analysis. FALL. [3] Staff.
- 244. The Legislative Process.** Legislative organization and processes in the U.S. Congress. Attention to parties, elections, institutional structure, interest groups, and other branches of government as they relate to the legislative process. SPRING. [3] Oppenheimer.
- 245. The American Presidency.** Constitutional, historical, and political aspects. Attention to nominating and electing the president, presidential leadership and personality, governing, and relations with Congress and the public. SPRING. [3] Staff.
- 247. American Political Culture.** Content, historical development, and political consequences of the American public's deeply rooted values concerning how the political system ought to work and the ends it ought to serve. Attention to regional variation. FALL. [3] Staff.

- 253. Ethics and Public Policy .** Ethical argument in the public policy process; major approaches to ethics applied to specific issues of public policy. [3]
- 255. Public Policy Problems.** Specific problems of public policies and their relations to political and institutional structures. Particular policy problems vary from semester to semester. May be taken more than once only if there is no overlap with a prior offering. [3] (Not currently offered)
- 260. Introduction to American Law.** Law as a component of public policy and the political system; the elements and rationale of private law. FALL. [3] Staff.
- 261a. Constitutional Law: Powers and Structures of Government.** Development of U.S. constitutional system and fundamental principles of constitutional interpretation. Judicial development of principles of distribution and scope of governmental powers. Case method. No credit for students who have completed 261. FALL. [3] Staff.
- 261b. Constitutional Law: Civil Liberties and Rights.** Supreme Court's interpretation of the Bill of Rights and the Fourteenth Amendment. Case method. No credit for students who have completed 261. SPRING. [3] Staff.
- 262. The Judicial Process.** Functioning of the judiciary in the American political process; operation and powers of the courts; nonlegal aspects of the judicial process; political role and effects of judicial decisions. SPRING. [3] Staff.
- 263. Religion and Politics.** Religion in democratic societies. Abortion, gay marriage, faith-based initiatives, and the Pledge of Allegiance. Historical works and contemporary contributions to debates. [3] (Not currently offered)
- 270. Conducting Political Research.** Introduction to research sources, designs, and methods used by political scientists. Emphasis will be placed on locating and accessing data, the logic of causal inferences, and basic data presentation and analysis. SPRING. [3] Staff.
- 272a. Nashville Survey Research Seminar.** Survey research methodology and its application in a metropolitan setting. Using survey data to understand human behavior and opinion; questionnaire design, sample design, the methodology of face-to-face interviewing, and pretesting. FALL. [3] Globetti, Seligson.
- 272b. Survey Research Training.** Prerequisite: 272a. May not be counted toward a major in political science. FALL. [1–3] Globetti, Seligson.
- 272c. Survey Research Practicum.** Prerequisite: 272a. May not be counted toward a major in political science. FALL. [1–3] Globetti, Seligson.
- 300. Political Theory.** Basic course in political theory. Surveys major texts in political theory, as well as central concepts and debates in the current literature. [3] (Not currently offered)
- 302. Democratic Theory.** Growth of democratic theory in political philosophy and historical application. Connections between democratic theory and political institutions. SPRING. [3] Booth.
- 303. Philosophy of Science for Social Science.** Survey of basic texts and issues within the philosophy of science as these are relevant within the social sciences. The materials are explored from the perspectives of the different theoretical and methodological options within the social sciences with rigorous applications to examples within the basic sub-fields of political science and from the cognate disciplines from which political science research and theorizing draws (including parallels from the disciplines of anthropology, economics, history, psychology, and sociology). [3] (Not currently offered)

305. Feminist Social and Political Thought. Feminist political theorists, both as critics of the history of political thought and as authors of contemporary social and political theory. FALL. [3] Ackerly.

306. Problems of Interpretation in Political Theory. Major interpretive problems of political theory. Emphasis on philosophical assumptions, meaning, text, and context. May be repeated for credit if topics vary sufficiently. [3] (Not currently offered)

308. Studies in Historical Political Thought. Major texts and themes focusing on a single thinker, a school of thought, or a theme. May be repeated with different topics. SPRING. [3] Ackerly.

309. Research in Political Theory . Supervised individual research and reading on selected topics in political theory. FALL, SPRING. [3] Staff.

310. Studies in Comparative Analysis. A survey of important literature and concepts in the field of comparative politics. [3] (Offered 2008/2009)

311. Regional and International Dimensions of European Integration. Theories of political and economic integration; key actors in the European Union (including national and subnational governments, EU institutions, interest groups, and citizens); principal EU policy arenas and issues (including economic and monetary union, the single market, the common agricultural policy, regional policies, joint foreign and security policies). [3] (Not currently offered)

312. Comparative European Politics. Political development, institutions, behavior, and public policies in key West European democracies. Thematic foci include postindustrialism, corporatism, and political management of the economy. [3] Hancock.

315. Research in Latin American Politics. Recurring and novel topics in Latin American politics, such as the relation between economic growth and political regimes, the role of the Church, human rights, and U.S. foreign policy. Particular issues vary from semester to semester. [3] Hiskey, Seligson.

316. Politics of Change in the Third World. Patterns and problems in Third World countries, including transnational developments and linkages such as foreign aid and alignments, multinational corporations and other such institutions, regional groupings, "development," and "modernization." [3] Seligson.

317. The Political Economy of Development. The causes of international and national inequalities in the distribution of wealth, both among nations, and within developing states. Factors related to economic development and their impact on domestic and international income distribution. The impact of geography, natural resources, culture, democracy, the size of the military, rent-seeking, urban bias, and the world-system on inequality. FALL. [3] Seligson.

318. Qualitative Methods and Small-N Analysis. Theoretical introduction and practical application of various methods of qualitative analysis, including case studies, small-N comparison, Boolean analysis, event-structure analysis, counter-factual analysis, and concept formation. [3] (Not currently offered)

319. Research in Comparative Analysis. Supervised individual research and reading on selected topics in comparative politics. FALL, SPRING. [3] Staff.

320. International Politics. Basic course in international politics. Surveys major subfields, focusing on concepts and theories that orient research—e.g., balance of power, interdependence, imperialism, decision-making, crisis-behavior. FALL. [3] Mattes.

- 321. International Conflict: Theories and Methods.** Analysis of international conflict and war. SPRING. [3] Ray.
- 322. Peace Research.** Alliances, crisis escalation, territorial disputes, and characteristics of peaceful systems. [3] Staff.
- 323. Current Theory and Research in World Politics.** Recent trends in theory construction, research design, and findings. [3] Staff.
- 325. International Political Economy.** Patterns of conflict and cooperation in the world economy. Theories of world systems, dependency, neoclassicism, regimes, and public choices, their applicability to trade, money, debt, industrial organization, economic development, regional integration. [3] (Not currently offered)
- 326. The Political Economy of War and Peace.** Economic theories of war and peace, including economic actors, conditions, and motivations believed to contribute to conflict and cooperation between nations. "Economic statecraft" will also be covered. [3] (Not currently offered)
- 327. Domestic Politics and International Interactions.** Impact of domestic political structures and processes on foreign policies and international politics. Extent to which factors external to states in their international environment affect domestic politics. [3] (Not currently offered).
- 329. Research in International Politics.** Supervised individual research and reading on selected topics in international politics. FALL, SPRING. [3] Staff.
- 330. Studies in American Politics.** A survey of important literature and concepts in the field of American politics. [3] Staff.
- 331. Party Politics.** Structure and functions of political parties; theories of partisan change, party formation, and party organization. Influence on rules and the behavior of politicians on party policies. [3] Hetherington.
- 332. Electoral Behavior and Public Opinion.** Theories of voting and behavior of candidates in American elections; models of electoral change; the development and dynamics of public opinion. Effects of elections and public opinion on policy and governmental action. [3] Staff.
- 333. Political Culture, Opinion, and Behavior.** Politics as a contest of meaning; how issues, structures, and events are signified; the patterns and distributions of core beliefs as the foundation of individual and collective political behavior and institutional politics. [3] Staff.
- 334. Executive Institutions.** Theories of decision making and implementation in executive institutions. Application of theory to the executive institutions of American government, including the presidency, cabinet departments, and agencies. The relationships of elected politicians, political appointees, and civil servants in executive institutions. [3] (Not currently offered)
- 335. Politics of American Legislation.** The structure and function of American legislative institutions, especially Congress, and their relation to the wider setting. SPRING. [3] Oppenheimer.
- 336. The Judicial Process.** The role of the judiciary in the American political process; operation, staffing, and powers of the courts; political role and effects of judicial decisions; policy-making by the courts. SPRING. [3] Corley, Tate.
- 339. Research in American Politics.** Supervised individual research and reading on selected topics in American politics. FALL, SPRING. [3] Staff.
- 355. Research Design.** Introduction to Analysis of Tables, Measures of Association, OLS regression. Coverage of research design. Experimental design, survey research, elite interviewing, in-depth interviewing, aggregate data, field research, content analysis, case

studies, and small-n analysis. Emphasis on concept formation and measurement. FALL. [3] Tate.

356. Statistics for Political Research I. Introduction to statistical analysis with applications in political science, statistical distributions, statistical inference, bivariate and multiple regression, logit, and probit. SPRING. [3] Globetti.

357. Statistics for Political Research II. Advanced topics in statistical analysis with research applications in maximum likelihood estimation, logit and probit analysis, simultaneous equation models, generalized least squares, and introductory time series concepts. FALL. [3] Globetti.

358. Topics in Political Methodology. May be repeated for credit when topics vary. [3] Staff.

359. Introduction to Formal Theory and Modeling. Social choice and game theory. Instability and disequilibria of group decisions under different decision-making rules. Theoretical model building as a way to generate hypotheses. Rules in decision making, manipulability of outcomes, bargaining strategies and the evolution of cooperation. [3] Benson.

360. Topics in Formal Theory and Modeling. May be repeated for credit when topics vary. SPRING. [3] Benson.

361. Writing Proposals and Securing Grants in the Empirical Social Sciences. FALL. [3] Seligson.

369. Master's Thesis Research. [0]

370. Topics in Political Science. An inquiry into selected topics. May be repeated for credit when topics vary. Consult *Schedule of Courses* for offerings. [3] Staff.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

390a–390b. Independent Study. FALL, SPRING. [Variable credit: 1–3 each semester]

398. Dissertation Seminar. Focus on developing the theoretical, empirical, and normative aspects of each student's dissertation research. SPRING. [3]

399. Ph.D. Dissertation Research.

3995. Half-time Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

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Psychology

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RESEARCH ASSISTANT PROFESSORS Christine Collins, Leslie D. Kirby, Haidong Lu, Hui-Xin Qi, Iwona Stepniewska

SENIOR LECTURERS Leslie M. Smith, N. Jane Zbrodoff

DEGREES OFFERED: *Master of Arts, Doctor of Philosophy*

✦ THE graduate program in Psychological Sciences marshals the combined resources of the Department of Psychology in the College of Arts and Science and the Department of Psychology and Human Development in Peabody College. The program offers doctoral-level (Ph.D.) study for students who intend to become psychological scientists or scientist-practitioners. Students who plan to terminate their studies with the master's degree should not apply. Although students and faculty are each associated with a primary home department (either the Department of Psychology or the Department of Psychology and Human Development), a common set of requirements applies to all students.

Five primary areas of interest are represented in the Psychological Sciences graduate program (clinical science, cognition and cognitive neuroscience, developmental science, neuroscience, quantitative methods and evaluation). In addition, some faculty and students participate in an interdisciplinary program in social psychology. The Department of Psychology in the College of Arts and Science has particularly strong representation in the areas of clinical science (with a general focus on adult populations), cognition and cognitive neuroscience, and neuroscience. These concentrations constitute the primary area groups within the department. However, faculty and students also contribute to the other areas of interest represented within the broader Psychological Sciences program.

The primary objective of graduate training is to promote the development of the necessary conceptual and methodological skills that will allow our graduates to function as independent scientists who conduct innovative and important research. Consistent with this goal, we expect our graduate students to be continually involved in research throughout their

graduate training. Candidates for the Ph.D. degree must have completed 72 hours of graduate credits with a minimum of 24 hours in formal course and seminar work. In addition, students must satisfactorily complete a qualifying examination for Ph.D. candidacy.

Students seeking admission to the program should apply to Psychological Sciences. Applicants should submit scores on the General Test and an advanced test of the Graduate Record Examination. In addition to overall potential for a scientific career, the fit between an applicant's research interests and those of a potential faculty mentor significantly influence admissions decisions. Admission is not limited to students with undergraduate backgrounds in psychology.

Note: NSC courses 201 (Neuroscience), 235 (Biological Basis of Mental Disorders), 269 (Developmental Neuroscience), 272 (Structure and Function of the Cerebral Cortex), and 274 (Neuroanatomy) are taught in the psychology department and count as "in department" courses. Prior to the 2008/2009 school year these courses had a PSY designator. The courses are equivalent and are eligible for graduate credit. See the Neuroscience course listings for descriptions of these classes.

216. Movement. Psychological, computational, and neural perspectives on the activities of looking, reaching, grasping, speaking, smiling or frowning, walking, and running. FALL. [3] Schall.

234. Laboratory in Behavioral Neuroscience. Experimental methods in behavioral neuroscience. Computer-based data acquisition and analysis, statistical reasoning, and manuscript preparation. Prerequisite: NSC 201. SPRING. [4] Staff.

238. Social Cognition and Neuroscience. Neural underpinnings of social perceptions, evaluations, and decisions. Face perception, attraction and reward processing, social cooperation and competition, decision making, and moral judgments. SPRING. [3] Tong.

258. Animal Behavior and Evolutionary Psychology. A comparative and phylogenetic approach to the study of behavior, with special emphasis on sensory processes, instinctive behavior, the genetics of behavior, and ethology. SPRING. [3] Kaas.

277. Brain Damage and Cognition. Effects of neurological impairment from stroke, injury, or disease on perception, speech, memory, judgment, and behavior. Relation between brain systems and cognitive systems. SPRING. [3] Gauthier.

The following courses are seminars devoted to intensive study of special topics.

280. Special Topics in Perception. FALL. [3] Fox.

282. Special Topics in Cognitive Psychology. [3] (Not currently offered)

285. Special Topics in Neuroscience. [3] (Not currently offered)

286. Special Topics in Human Competence. [3] (Not currently offered)

288. Special Topics in Clinical Psychology. [3] (Not currently offered)

289. Special Topics in Social Psychology. SPRING. [3] W. Smith.

300a. Research Seminar. [Variable credit: 1–4]

301a–301b. Advanced General Psychology . Physiological psychology, perception and sensation, learning, complex processes, developmental, personality, social psychology, and psychopathology. Participation in various sections determined by each student's background and career interests. [3–3] Staff.

302. History and Systems of Psychology . Modern psychology viewed in the perspective of problems and theories of the past. Emphasis on major concepts, problem areas, developing methodology, and “schools” from which much of modern psychology has evolved. [3] (Not currently offered)

303. Models of Human Memory. Survey of contemporary models of human memory, especially formal models. Methods of fitting models to data will be discussed. Prerequisite: graduate course on cognition. [3] (Not currently offered)

304b. Quantitative Methods and Experimental Design. Principles and methods for the design and analysis of experiments and for the investigation of individual differences. Principles of experimental design and descriptive and inferential statistics. SPRING. [3–3] Tomarken.

305. Linear and Nonlinear Mixed Effects Models. The analysis of data from hierarchical and multilevel designs. Theory and computational methods, specification and testing of fixed effects, random effects and residuals, assessment of fit, graphical examination, applications to repeated measures data, and missing data models. Prerequisite: 304b or equivalent. [3] (Not currently offered)

306. Evolutionary Psychology. Interdisciplinary analysis of the origins of mind, with particular emphasis on the mind/brain as a product of biological evolution. [3] (Not currently offered)

307. Group Process and Structure. Social psychological theory relating to phenomena of social interaction; methodological and substantive problems in selected areas of research, such as group problem-solving, and interpersonal bargaining. [3] (Not currently offered)

310. Research Methods in Clinical Psychology . Major methodological and quantitative issues in clinical psychology, including statistical significance testing and its alternatives; threats to internal and external validity; psychometric theory; quantitative approaches to classification; behavioral, genetic, and psychophysiological methods; animal models; analysis of change, mediation, and moderation. [3]

Courses 312, 314, 315, 323, and 324 are limited to psychology Ph.D. students.

312. Psychological Assessment. Major techniques of psychological assessment, with an emphasis on the rationale, administration, and interpretation of measures assessing personality and psychopathology. SPRING. [3] Zald.

315. Theories of Psychotherapy. Advanced study on the major principles, concepts, techniques, and issues relevant to the theory and practice of psychotherapy. Experience in supervised clinical settings or observation of clinical sessions is provided to further understanding of psychotherapeutic processes. FALL. [3] Davis.

316. Brain Imaging Methods. Principles and methods used in human neuroimaging, with emphasis on functional magnetic resonance imaging (fMRI). [3] Marois.

320. Analysis of Categorical Data. Statistical analysis of binary, nominal, or ordinal, and count data from the perspective of generalized linear models. Logistic and Poisson regression models. Population-averaged and subject-specific approaches to repeated measures.

Prerequisite: Psychology and Human Development 310P, Psychology 304B, or equivalents. FALL. [3] Tomarken.

323. Practicum in Psychological Assessment. FALL, SPRING. [Variable credit: 1–5 each semester] Staff.

324. Practicum in Psychotherapy. FALL, SPRING. [Variable credit: 1–5 each semester] Staff.

325. Advanced Standing in Psychological Assessment. FALL, SPRING. [Variable credit: 1–5 each semester] Staff.

326. Advanced Standing in Psychotherapy . FALL, SPRING. [Variable credit: 1–5 each semester] Staff.

331a–331b. Advanced Investigational Techniques. A non-thesis research project. Should be registered for only after consultation with the staff member who will be supervising the work. [Variable credit: 1–6 each semester] Staff.

335. Special Topics in Neuroscience. (Also listed as Cell and Developmental Biology 335 and Neuroscience 335) Basic issues in neuroscience. Possible topics include neural development, neural plasticity, regeneration, organization and function of cortex, sensory systems, motor systems, and research methodology in neuroscience. A new topic is considered each semester (as per Cell and Developmental Biology). Prerequisite: Cell and Developmental Biology 323 or equivalent course. [2] (Not currently offered)

336. The Visual System. (Also listed as Cell and Developmental Biology 347, Electrical Engineering 351, Neuroscience 347) An interdisciplinary approach to how humans see and interpret their visual environment. Topics include the structure of the eye and brain (including optics), the physiology of individual cells and groups of cells, machine vision and models of visual function, visual attention, and mechanisms of complex visual perception. Lectures by faculty from Psychology, Engineering, and Cell and Developmental Biology. Graduate students attend one hour discussion section per week, in addition to lecture, and turn in a more extensive paper than undergraduates. SPRING. [3] Roe.

The following graduate seminars, 341–355, may be repeated up to four times each.

342. Seminar: Social. FALL. [3] W. Smith.

343. Seminar: Perception. [3]

344. Seminar: Neuroscience. [3]

351. Seminar: Cognitive Psychology. FALL, SPRING. [3] Tong, Palmeri, Logan.

352. Seminar: Clinical Psychology. [3]

353. Professional Ethics in Clinical Psychology. Issues and practical applications of ethical principles in clinical and research settings. Cultural context for clinical and ethical issues. SPRING. [3] Davis.

354. Clinical Neuropsychology. Cognitive and behavioral disorders associated with brain injury and disease. Methods of neuropsychological assessment. Prerequisite: 343P or permission of instructor. [3] Zald.

357. Seminar in Cognitive Science. Integration of the subareas of cognitive science. FALL, SPRING. [Variable credit: 1–2 hours each semester] Staff. May be repeated up to four times.

358. Seminar in Neuroscience. Integration of the subareas of neuroscience. FALL, SPRING. [Variable credit: 1–2 hours each semester] Staff. May be repeated up to four times.

360. Seminar in Clinical Science. Integration of the subareas of clinical science. Includes history and systems of psychology as related to clinical science, ethical issues, and problems encountered in professional psychology. FALL, SPRING. [Variable credit: 1–2 hours per semester] May be repeated up to four times.

361. Interdisciplinary Seminar in Social Psychology. Integration of the disciplinary subareas of social psychology. May be repeated up to four times. FALL, SPRING. [1–2] W. Smith.

369. Master's Thesis Research. [0]

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

398. Internship. FALL, SPRING. [0] Staff.

399. Ph.D. Dissertation Research.

Psychology and Human Development

CHAIR David A. Cole

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David S. Cordray, Paul R. Dokecki, Elisabeth M. Dykens, Dale Farran, Judy Garber,

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RESEARCH ASSISTANT PROFESSORS Chase A. Lesane-Brown, Julia Noland

ASSISTANT CLINICAL PROFESSOR Vicki S. Harris

SENIOR LECTURER Steven McFadyen-Ketchum

LECTURERS Gayathri Narasimham, Leigh Wadsworth

DEGREES OFFERED: *Master of Science, Master of Education,
Doctor of Philosophy*

✦ THE graduate programs in Psychology and Human Development emphasize basic research as well as empirical, data-based approaches to practical problems in education and human development. There is particular concern with the discovery of new ways to bring psychological knowledge and research skills to bear on societal problems, especially those amenable to intervention during the early years of life.

Major in Psychology and Human Development

<i>Department</i>	<i>Area of Specialization</i>
Psychology and Human Development	General Psychology (M.S. only) Child Studies (M.Ed. only) Clinical Psychology Cognitive Studies Developmental Psychology Quantitative Methods

For the Ph.D., areas of specialization include clinical psychology, cognitive studies, developmental psychology, and quantitative methods. Students may take a master's degree as part of their doctoral program.

Specific guidelines and requirements beyond general departmental regulations are set by training committees in each area of specialization.

210P. Introduction to Statistical Analysis. Selection, application, and interpretation of measures of relative frequency, location, dispersion, and association. Approaches to statistical inference. Not open for credit to graduate students in psychology. [3]

211P. Statistical Analysis. Second course in statistics for upper division undergraduates and students in education, counseling, special education, and related social and behavioral sciences. One-factor and multifactor analysis of variance designs with both between-groups and within-groups factors, goodness of fit and contingency analysis, measures of general and linear regression. Inferences concerning means, variances, proportions, and correlations. [3]

289P. Ethics for Human Development Professionals. Normative evaluation of ethical issues in serving human need. Conflicting values within moral dilemmas will be examined from a variety of theoretical perspectives and practical criteria. Case studies of moral issues confronting the individual, the family, service organizations, and the general public will be reviewed. [3]

301P. Methods of Psychological Research. Methods for collecting and analyzing empirical information about behavior. Serves as a base upon which to build research competence through more advanced courses and research apprenticeships. [3]

303P. Research Methods in Developmental Psychology. Major empirical approaches to the study of development. Emphasis on human behavioral development, although elements from comparative psychology and biomedical sciences included. [3] (Not currently offered)

304P. Field Research Methods. The purpose of this course is to provide the student with an introduction to applied social research in field settings. The course will provide the student with an understanding of basic issues in measurement and design as well as practical skills needed to conduct research in real world settings. Basic knowledge of statistics suggested. [3]

305P. Research Methods in Child Clinical Psychology. Research with clinical populations with a particular emphasis on methods applied to the study of children, youth, and families. [3]

309P. Introduction to Statistical Inference. Introduction to statistical methods for graduate students in education and psychology with minimal undergraduate statistical background. The course will present descriptive and inferential methods for assessing distributional shape, central tendency, variability, and association. An introduction to statistical computing with popular general purpose statistical computer programs will be provided. [3]

310P. Statistical Inference. Introductory course designed to familiarize doctoral students with the principles and procedures of statistical inference and to prepare them for more advanced work in research design and analysis. [3]

311P. Experimental Design. Application of statistical concepts and inferential techniques to the design and analysis of experiments in the behavioral sciences. Advanced procedures for analysis of variance and analysis of covariance. Prerequisite: 310P or equivalent. [3]

312P. Multivariate Statistics. Psychological measurement theory, along with correlational and regression analysis techniques essential to the development of that theory. Prerequisite: 310P or equivalent. [3]

313P. Correlation and Regression. Fundamental concepts in bivariate and multiple regression and correlation techniques. Emphasizes the theory and assumptions underlying OLS and logistic regression, computational procedures, and interpretation of results. Specific applications include: (1) coverage of the full range of correlation indices; (2) a range of regression strategies (e.g., reduced-form regression, path analysis, ordered and unordered step-wise inclusion); (3) statistical power; (4) regression diagnostics; (5) nonlinear regression and linearizing transformations; (6) testing interactions; and (7) conditions for causal analysis and analysis of change. [3]

314P. Structural Equation Modeling. This course introduces the basic principles of path analysis, confirmatory factor analysis, and latent variable structural modeling, which constitute a powerful set of statistical tools for examining correlational, observational, and even experimental data in the social sciences. Computer techniques for conducting these analyses will also be taught: the LISREL program in particular, but AMOS will also be introduced. [3]

315P. Program Evaluation. The evaluation of social programs. The design of evaluations to produce both theoretically meaningful and practical information about the program and its effectiveness. Such topics as needs assessment, monitoring, impact assessment, and cost/effectiveness evaluations. Covers programs in education, health, and human services. [3]

317P. Psychological Measurement. Fundamental concepts, methods, and principles of psychological measurement. Particular attention will be devoted to reliability and validity issues underlying psychometric theory, and how psychometric theory relates to the assessment of individual differences or human variation more generally. Topics will include multiple regression, factor analysis, and item response theory. [3]

318P. Individual Differences. Focuses on traditional concepts and findings in the area of individual differences broadly defined. The psychological content will primarily involve abilities, interests, and personality; methodological issues encountered in assessing these attributes will be stressed throughout; and particular attention will be devoted to how these concepts can enhance research programs in both applied and theoretical areas. The specific variables discussed within each domain will be restricted to those that have empirically "panned out" (viz., variables that are reliable and related to meaningful behaviors and outcomes that psychologists are interested in predicting and better understanding), rather than theoretical constructs and measures whose external validity is unknown. [3]

319P. Advanced Seminar in Measurement, Statistics, and Evaluation. Special topics in measurement, statistics, and program evaluation. May be repeated with change of topic. Prerequisite: consent of instructor. [3]

325P. Proseminar in Mental Retardation. (Also listed as Special Education 3250) Variable topics. May be repeated with change in topic. [2]

334P. Psychological Foundations of Education. (Also listed as Education 3110) Psychological theories and research as related to the design and practice of education. Specific

consideration of the developmental bases of teaching, learning, and student performance (early childhood through adult); individual differences in education with particular reference to socioeconomic status, disabling conditions, learning style, and gender; evaluation of learning; classroom and organizational influences on school effectiveness; family-school relations. [3]

336P. Behavioral Pediatrics and Child Health Psychology. Behavioral pediatrics and child health psychology for advanced predoctoral and postdoctoral trainees. Topics include the scope and definition of behavioral pediatrics, measurement of child behavior, children's health beliefs and understanding of illness, theories of psychosomatic illness, immunologic and endocrinologic aspects of stress, compliance, psychological effects of physical illness, families' responses to stress, and psychological intervention strategies. [3]

338P. Family Therapy. Techniques of family and marital therapy, integrating cognitive-behavioral, systemic, and structural approaches. [3]

339P. Advanced Seminar in Educational Psychology. May be repeated with change of topic. [Variable credit: 1–3]

340P. Psychopathology. The major forms of psychopathology: child, adolescent, and adult. Recent research, classification systems, and developmental variables affecting psychopathology. [3]

343P. Psychological Assessment. A general introduction to clinical assessment, with a particular emphasis on children. The major purpose is to familiarize students with the theoretical issues and psychometric properties of several different methods of assessment including objective and projective personality measures, behavior checklists, behavioral observation, and clinical interviews. Required before taking practica. Prerequisite: consent of instructor. [3]

344P. Psychological Intervention: Individual Focus. Theories and research in psychotherapy. Some initial skill training will be provided. Required before taking practica. Prerequisite: 343P. [Variable credit: 1–3]

345P. Seminar in Systems and Community Psychology. Systems and social ecology theory, and community applications of systems psychology. [3]

347P. Advanced Seminar in Community Psychology. May be repeated with change of topic. [Variable credit: 1–3]

349P. Advanced Seminar in Clinical Psychology. May be repeated with change of topic. [3]

350P. Human Learning. Overview of the major experimental approaches to human learning, with an emphasis on the limitations/contributions of each paradigm. [3]

352P. Human Cognition. Current research and theory in cognitive psychology. Emphasis on memory, perception, and language. Some applications of cognitive theories are explored. [3]

353P. Advanced Seminar: Cognitive Studies. Special topics in cognitive studies. May be repeated with change of topic. [3]

354P. Language and Text Processing. Fundamental survey course in language, required for students in the cognitive studies Ph.D. program. Focuses on the psychological and linguistic aspects of sentence and discourse processing, with some attention to computer simulations. Class sessions are generally a combination of lecture material and student presentation. [3]

355P. Sociobiology. Evolutionary models of social behavior across a wide range of species. Specific topics include: kin selection and inclusive fitness; space utilization; parent-infant interactions; aggression; kin recognition; mate choice and reproductive strategies and communication. [3]

357P. Seminar in Behavioral Biology. Selected topics in behavioral biology—e.g., ethology. Content varies according to student needs and interests. May be repeated. [3]

360P. Developmental Psychology. Central issues, theories, and methods. [3]

361P. Seminar in Cognitive Development. Major theoretical and conceptual issues in cognitive development. Emphasis in current research topics like memory development, reading, conceptual development, semantic development, problem solving, and reasoning. Recommended background: 352P and/or 360P. [3]

363P. Seminar in Social and Personality Development. Development of personality and social processes, with emphasis on methods of inquiry. Trait theory, socialization processes, origins of gender differences, cultural differences in childbearing practices, experimental and observational methods in developmental research, and development of motivational systems. [3]

368P. Advanced Seminar in Developmental Psychology. May be repeated with a change of topic. [3]

369P. Master's Thesis Research. Open only to candidates for the Master of Science degree engaged in thesis research and writing. Consent of major professor required. [Variable credit: 1–6]

370P. Theories of Personality. Psychoanalytic theories, phenomenological theories, and behavioral theories. The process of theory development and the interaction of theory and empirical confirmation. [3]

375P. Social Psychology. Emphasis on current theory and research. [3]

378P. Current Research in Social Psychology. A seminar on the current state of the field of social psychology as explored through critical analysis of recent journal articles. May be repeated. [3]

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

380P. Assessment of Intellectual Functioning. The measurement of intellectual functioning; effective report writing; skills associated with test administration and scoring and the development of intelligence over the life span. Behavioral and vocational correlates of intelligence and competence. Methods for psychoeducational remediation. [3]

381P. Cognitive Theories of Mathematical Learning. (Also listed as MTED 3810.) Examines the research literature on mathematical learning at the elementary and secondary levels. Considers both the epistemological assumptions and implications of information-processing theories, situated cognition theories, activity theory, and constructivism. [3]

382P. Assessment of Personality. Assessment of children and adolescents in varied contexts using personality tests in practical settings, with emphasis on projective testing and the clinical method. Interpretation and report writing. Prerequisite: consent of instructor. [3]

384P. Intervention: Basic Issues. Critical analysis of intervention through examination of the historical, philosophical, political, economic, social, ethical, and value issues that underlie intervention efforts by behavioral and social scientists. [3]

386P. Psychological Intervention with Children. Various intervention approaches with children, including parent training, behavior therapy, group therapy, psychopharmacological intervention, individual psychotherapy, cognitive behavioral intervention, psychoanalytic play therapy, and residential treatment. [3]

389P. Seminar on Psychological Issues and Ethics. Emerging professional and ethical issues confronting psychologists engaged in research or practice. [1]

390P. Clinical Applications and Practicum I. This two-semester sequence is required for doctoral students in clinical psychology. The sequence involves applications of theoretical

principles of behavior change in clinical settings. Didactic meetings will integrate the empirical and theoretical literatures with problems in clinical application. Students will participate in clinical practice (assessment and intervention) under program faculty supervision. Prerequisite: psychopathology, clinical assessment, and intervention, as well as consent of instructor. [1–3]

391P. Clinical Applications and Practicum II. This two-semester sequence is required for doctoral students in clinical psychology. The sequence involves advanced application of theoretical principles of behavior change in clinical settings. Students will participate in clinical practice (assessment and intervention) under the joint supervision of program faculty and adjunct faculty in community settings. Prerequisite: 390P. [1–3]

392P. Clinical Psychology Internship. Required of all Ph.D. students in the clinical program. Specialty rotations, generalized training, didactic instruction, and supervised research are offered during one full year of clinical experience in an academic clinical setting or similar internship facility accredited by the American Psychological Association (APA). Credit hours: students register for *zero hours* to reflect full-time involvement in supervised clinical psychology internship. Grading is on a Pass/Fail basis. [0]

393P. Advanced Seminar in Personality and Social Psychology . May be repeated with change of topic. [Variable credit: 1–3]

396P. Special Topics in Psychology. May be repeated with change of topic. [Variable credit: 1–4]

397P. Readings and Research in Psychology. Individual programs of reading or empirical research in psychology. Prerequisite: consent of faculty supervisor. May be repeated. [Variable credit: 1–3]

399P. Ph.D. Dissertation Research. [Variable credit]

3995. Half-time Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

Religion

CHAIR John S. McClure

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DEGREES OFFERED: *Master of Arts, Doctor of Philosophy*

✦ STUDENTS may be admitted upon graduation from an accredited college with a baccalaureate degree or from an accredited seminary or graduate school with a post-baccalaureate degree. Ordinarily, students with only the baccalaureate degree are admitted to the M.A. program. Successful completion of the latter provides a foundation for doctoral studies but does not guarantee admission to the Ph.D. program. Students with an M.Div., M.T.S., or M.A. degree may be admitted directly to the Ph.D. program. Applicants with the B.A. degree are advised to consider not only the M.A. program in the Graduate School, but also the two-year M.T.S. program in the Divinity School of Vanderbilt University as preparation for Ph.D. work.

Degree programs are offered in ethics and society; Hebrew Bible; historical studies; history and critical theories of religion; homiletics and liturgics; Jewish studies (M.A. only at present); New Testament; religion, psychology, and culture; and theological studies. Interdisciplinary studies, both within religion and in other areas of knowledge, are encouraged. The study of religion is pursued both as a critical, humanistic discipline, employing a variety of methodological perspectives, and as a theological discipline, interpreting religions and their historical, theological, and ethical heritage.

Master of Arts

The M.A. program is designed to enable students to explore personal interests or vocational options, to acquire a background for teaching at the secondary level, or to attain a foundation for further studies at the doctoral level. A total of 24 credit hours and a thesis are required for the first two programs described below, while the final two programs have special requirements.

1. *Specialty M.A.* This program involves a concentration in one of the subspecialties of religious study. Students will select a major of at least 12 hours and a minor of at least 6 hours from the following areas: ethics and society; Hebrew Bible; historical studies; history and critical theories of religion; homiletics and liturgics; Jewish studies; New Testament; religion, psychology, and culture; and theological studies. The remaining hours may be chosen from the above areas or from other departments of the Graduate School.

2. *Cross-Disciplinary M.A.* This program, to which students are admitted under exceptional circumstances, provides an opportunity for students to relate one of the subspecialties of religious studies to an appropriate supportive discipline. Normally, 12 hours are taken in one of the areas listed under the specialty M.A., with the remaining hours taken in another department of the Graduate School. The thesis will attempt to integrate the methods and subject matters of the two disciplines in relation to a chosen problem.

3. *Terminal M.A.* The terminal M.A., offered exclusively for Ph.D. students who elect not to complete the Ph.D. program, may be received by students who have demonstrated reading knowledge in at least one foreign

language at the level required for the M.A. degree; have completed 48 semester hours of formal, graded course work at the graduate level, including at least 24 hours at Vanderbilt; have passed an oral examination conducted by a committee of faculty members from the Graduate Department of Religion; and do not seek candidacy for the Ph.D. degree.

4. *Master's Degree in Passing.* Ph.D. candidates may earn the M.A. degree upon completion of at least 42 hours of graduate study, satisfaction of the language requirements, passing of the Ph.D. qualifying exam, and approval of the dissertation proposal according to the GDR guidelines.

All M.A. candidates demonstrate reading competence in one foreign language, ancient or modern, as may be required in the program or area of concentration. The student may satisfy this requirement by performing satisfactorily in the departmentally administered Ph.D. language examination, taking and passing with the grade of B+ or higher a Vanderbilt University course designed specifically to teach graduate students to use the language in research, or by presenting an acceptable record of at least 12 hours (or its equivalent) in a language. Candidates specializing in Hebrew Bible or New Testament are expected to work with the original texts in Hebrew or Greek. Students designating Greek or Hebrew as the foreign language may not count introductory courses in these languages toward the requisite 24 hours for the degree.

Joint J.D.–M.A. Program. Students who have been admitted to both the Law School and the Graduate School may work toward the J.D. and the M.A. in religion concurrently. Six hours of religion credits will be accepted toward the J.D. degree, and 6 hours of law credits will be accepted toward the M.A. in religion. The joint program normally takes four years. For further information, write to the chair of the Graduate Department of Religion.

Doctor of Philosophy

Ph.D. programs are currently available in the following areas of major concentration: ethics and society; Hebrew Bible; historical studies; history and critical theories of religion; homiletics and liturgics; New Testament; religion, psychology, and culture; and theological studies. Students applying to each of these areas may also apply for a fellowship from The Program in Theology and Practice (www.vanderbilt.edu/gradschool/religion/t&p).

Candidates for the Ph.D. degree must demonstrate reading knowledge of one modern language of research, a second language as designated and approved by the Area and the GDR, and additional languages as specified by the Area (see Area requirements). Each of the areas of major concentration specifies which languages are acceptable for its students. The requirement for modern languages may be satisfied by taking and passing with the grade of B+ or higher a Vanderbilt University course designed specifically to teach graduate students to use the language in research, or by passing the departmental reading examination. Beyond this department-wide requirement, in biblical studies a knowledge of Hebrew or Greek is required, and in some areas of historical studies a knowledge of Latin or Greek is required. Students should be prepared to learn such other languages, ancient and

modern, as may appear a requisite for scholarly interests. Students should check with their area directors concerning specific requirements.

Certificate Programs

Students enrolled full time in the M.A. or Ph.D. programs may earn graduate certificates in two areas: (1) Jewish Studies (offered through the interdisciplinary program in Jewish Studies, [www.vanderbilt.edu/jewishstudies/Cert in JS.htm](http://www.vanderbilt.edu/jewishstudies/Cert%20in%20JS.htm)) and (2) Religion, Gender, and Sexuality (offered through the Carpenter program in Religion, Gender, and Sexuality, www.vanderbilt.edu/divinity/carpenter).

I. The Study and Teaching of Religion

3601. The Study of Religion. Required of entering Ph.D. students in their first semester. Discussion of such topics as the methods, diversities, connections, purposes, and contexts of religious studies. [3] King.

3620. Practicum in the Teaching of Religion. Preparation for the teaching of courses in religious or theological studies through discussion of case studies, issues, and problems. Required for all graduate students of religion during the first semester in which they are serving as teaching assistants. Can be repeated. Not open to others except by permission of instructor. Pass/Fail. [0] Staff.

3690. Master's Thesis Research. [0]

3790. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

3990. Ph.D. Dissertation Research. [0–12]

II. Languages and Methodologies

2210. Introductory Arabic I. Arabic script, elements of grammar, pronunciation, reading, writing, and elementary conversation. Experience Arabic culture and life through traditional and contemporary texts and audio-visual materials. [5] Hamad.

2211. Introductory Arabic II. A continuation of Arabic I, with a greater emphasis on everyday conversation, grammar, reading, writing. Prerequisite: Arabic I or equivalent credit by examination. [5] Hamad.

2500–2501. Elementary Biblical Hebrew. A two-semester course of study leading to a reading knowledge of the Hebrew Bible. Open for credit to M.A. students only. [3–3] Staff.

2514–2515. Elementary Modern Hebrew. Introduction to alphabet, the basics of grammar, and elementary conversation. Spring: greater emphasis on conversation and grammar. Open for credit to M.A. students only. [3–3] Staff.

2600–2601. Beginning Koiné Greek. A two-semester course of study leading to a knowledge of the New Testament. Open for credit to M.A. students only. [3–3] Staff.

2602. Intermediate Greek I. Classical and Koiné Greek. Review of Greek grammar and readings from classical and biblical texts. Open for credit to M.A. students only. [3] Gaca.

3102–3103. Intermediate Modern Hebrew. Modern Hebrew reading, conversation, and advanced grammar. Spring: greater emphasis on reading and writing. Prerequisite: one year of Modern Hebrew or its equivalent. [3–3] Staff.

3180. Readings in the Greek New Testament. A reading course in selected New Testament texts for students who have taken 2600–2601 or its equivalent. [1] Staff.

3802. Exegesis Seminar. Study of the principles, methods, and tools used in the critical study of the Hebrew Bible, including textual, historical-critical, ideological, literary, and other exegetical methods. [3]

3810. West Semitic Inscriptions. Readings in selected Phoenician, Aramaic, and Punic texts, with relevant grammatical analysis. Knowledge of Hebrew required. [3] J. Sasson.

3814. Intermediate Hebrew. Designed for students who have completed an elementary course in Hebrew and need more work in the areas of grammar, syntax, and reading of Hebrew texts. [3]

3815. Ugaritic. Elements of Ugaritic grammar, with reading in selected texts. Prerequisite: Elementary Biblical Hebrew. [3] Azzoni.

3816. Advanced Hebrew. Reading of selections from the Hebrew Bible, with emphasis on syntax and text criticism. Prerequisite: Elementary Biblical Hebrew. [3] Knight.

3818. Aramaic. Vocabulary, forms, and syntax of Aramaic through reading of the Aramaic sections of Daniel and Ezra and of specimens of material from the Elephantine papyri, the Targums, etc. Prerequisite: 3816. [3] Azzoni.

3821. Syriac. Vocabulary, forms, and syntax of classical Syriac, with readings from the Peshitta, Ephraem Syrus, etc. [3] (Not currently offered)

3826. Advanced New Testament Greek. Knowledge of Greek required. [3]

3827. Readings in Hellenistic Greek. Reading, translation, and grammatical analysis of select Greek texts from the Hellenistic period. Selections from the Septuagint, the New Testament, Josephus, Philo, the apostolic fathers, and the papyri. Emphasis on problems of translation and grammar, with special emphasis on the divergence of the Koiné from classical norms and the influence of the Semitic languages. [3]

3831. Akkadian I. Elements of Akkadian (Assyrian-Babylonian) grammar, with reading in selected texts. Consent of the instructor required. [3] J. Sasson.

3832. Akkadian II. Reading in selected historical, mythical, legal, and epistolary texts. Consent of the instructor required. [3] J. Sasson.

3833. Intermediate Akkadian: The Culture of Mari. In this seminar, students will read Akkadian cuneiform texts and gravitate toward more diverse themes, for example, religious, historical, or Wisdom texts, and to selected archives such as Mari, Ugarit, and Emar. Consent of instructor required. [3] J. Sasson.

3839. Cultural Criticism and the New Testament. An introduction to the paradigm of cultural studies in biblical criticism, with a focus on theoretical orientations, approaches to the text, and interpretations of texts. Previous work in biblical criticism required. [3] Segovia.

III. Ethics and Society

2758. Ethics in Theological Perspectives. This class will examine the central themes of morality, moral agency, deliberation, and moral discernment that define ethics as a discipline;

students investigate the moral arguments from teleological, deontological, and utilitarian perspectives and study the philosophical and theological figures and different theological ethics that have had a sustaining influence on Christian ethics in the West. [3] Snarr.

2814. Religion and Society. Examination of religion as a social phenomenon. Explores the writings of classical sociologists (especially Marx, Weber, and Durkheim). Readings in the areas of social theory, cultural analysis, and sociology of religion. Focus on the use of sociological insights toward understanding the relation between religion and Western social life. [3]

2815. Religion and Social Movements. This sociology seminar focuses upon the roles of religious organizations, individuals, and cultures in social-political movements for change; students will become engaged in the interdisciplinary conversations on the contributions and constraints that religious groups provide for social movements. Among the questions students will investigate are: What makes an activist? In what ways do religions provide resources—materially, ideationally, and culturally—for the emergence and maintenance of social movements? And in what ways are religious groups transformed by their interaction with the political process? [3] Snarr.

2816. Early Christian Political Thought. What are the roots of contemporary Christian understandings of the state and political life? How were early justifications of the divine right of kings maintained and challenged by Christian writers? Can the origins of democracy and human rights be traced back to early and medieval Christian thinkers? In what ways are our views of political violence formed by early traditions? Through a careful examination of some of the widely read (e.g. Augustine, Aquinas, Luther, Calvin) and lesser known (e.g. John of Salisbury, Grotius) Christian political thinkers, we will trace the development of Christian political thought from the patristic to reformation periods. [3] Snarr.

2817. Modern Christian Political Thought. Surveying Christian Political Thought from the late nineteenth century to contemporary debates, we will analyze theo-ethical understandings of the relation of Christianity to political life. Some questions the course will focus on are: Is there a necessary and important relationship between Christianity and democracy? What is the role of the public theo-ethicist in political debates? In what ways do various ecclesial and theological assumptions impact the political engagement of the church? Social gospel, Christian Realist, Anabaptist, Liberation, Catholic Social Thought, Feminist, and Fundamentalist approaches will receive particular attention. A theory-practice option for those who want to study the concurrent U.S. campaign season is available. [3] Snarr.

3400. Social Ethics. Focuses on an examination of religious and philosophical traditions that give rise to understandings of justice, duty, rights, and community. Attention paid to how these traditions inform moral judgments and shape the responses of moral communities. Particular examples, such as abortion, poverty, and racism employed to show how different moral traditions issue in social analysis and provide backing for normative moral judgments. [3]

3402. Ethical Issues in the Women's Movement. An examination of some of the central issues concerning women's status in present-day society through a sympathetic, yet critical, reading of key feminist texts. Authors examined include Brownmiller, Daly, Beauvoir, Friedan, Greer, and Jaggard. [3] G. Welch.

3403. Theology and Ethics in America. Explores the philosophical, theological, and ethical legacies of American philosophers and theologians who have significantly influenced theology and ethics in the United States and American public discourse. Students may encounter the traditions of American pragmatism, American Empirical Theology, Theology of the Social Gospel, American Neo-Orthodoxy, and American Public Theology and figures from William James and R. and H. R. Niebuhr to James M. Gustafson. [3] Anderson.

3410. Political Ethics: The Tradition of Political Liberalism. An examination of the political thought of prominent thinkers. [3] Anderson.

3411. Religion and War in an Age of Terror. Looking at both Christian and Islamic political thought, this course will wrestle with questions such as: When, if ever, is it appropriate to go to war? How has the emergence of “terrorism” as a form of war challenged traditional just war and pacifist theories? Are there ways in which religion and violence are inherently connected? How have religion and war been linked historically? In what ways do religious worldviews challenge or complement contemporary efforts at peacemaking? [3] Snarr.

3412. Ethics and Society: Justice. This advanced seminar will focus on contemporary theories of justice from both philosophical and theological perspectives (although it is heavily weighted towards the prior). Foci that drive the seminar will be how varying visions of justice are authorized in a pluralistic society, the role/understanding of religion in these theories, and how theories of justice may impact/criticize concrete policy decisions. Among the major theorists covered: Rawls, MacIntyre, Habermas, Fraser, Sen, Nussbaum, Young, Harrison, and Niebuhr. [3] Snarr.

3413. Ritual and Religious Experience. Four themes that appear in classical and contemporary literature in the social sciences: religion, religious experience, ritual, and symbol. [3]

3414. Seminar: Special Topic in Ethics. Provides a context for moral reflection upon a range of historical and contemporary social issues. Topics may include: The Moral Agent, Comparative Religious Ethics, Issues in Public Policy, Environmental Ethics, and Contemporary Social Problems (racism, violence, education, etc.). [3]

3414.03. Special Topics in Ethics: The Christian Ethics of Sex. This course will involve a critical survey of Christian texts and practices related to sex by considering such topics as celibacy, same-sex relations, marriage, procreation, and pleasure. Readings will include texts understood as both classic (the Bible, Jerome, Augustine, Aquinas, Luther, Hurston) and contemporary (Akinola, Jordan, Phelan, John Paul II, and Pinn). [3] Smith.

3415. Feminist Theological Ethics. Using resources from feminist traditions (womanist, mujerista, Asian, white), the course focuses on some major methodological, theoretical, and policy issues in feminist theological ethics. After tracing the historical development of the field of feminist theological/social ethics, we will analyze how feminists choose/use theoretical resources, the impact of varying theoretical frameworks on feminist analysis, major policy foci of feminists, and whether/how to stay with a “patriarchal” religious tradition. Readings from Christian, post-Christian, pagan, Islamic feminist. [3] Snarr.

3417. Tolerance, Identity, and Diversity in Modern Society. This course will introduce students to modern political theory through concrete questions of religious tolerance, identity, and diversity. Readings will combine classic texts in early modern political thought (e.g., Hobbes, Locke, Mill), significant contemporary works (e.g., K. A. Appiah, C. Taylor, U. Narayan, W. Cavanaugh), and case studies (e.g., John Brown and Theo van Gogh). At every point the theological perspectives implicit and explicit in the readings and cases will be given special attention. The course will also attend to the limits and paradoxes built into each of its key terms and to practical, political, and theological resources for working through and living with them. [3] Staff.

3419. Twentieth-Century North Atlantic Ethics. An examination of figures and movements that influenced the discourse on religious ethics in both Europe and North America. Special attention to representatives of History of Religions School (Troeltsch, Ott); logical positivism, political theology (Moltmann, Metz, Habermas); neo-orthodox and existential theologies (Brunner, Barth, Buber, Reinhold Niebuhr); as well as ethics influenced by Wittgenstein. [3] Anderson.

3422. African American Political Theology. Examination of the writings, speeches, and other cultural products (literature, films, music) of African Americans in their attempts to

give prophetic expression to the politics of race, gender, and class in the North American context. The politics of abolition and reconstruction, the politics of race, and the new cultural politics of difference approached theologically, historically, and critically. [3] Anderson.

3426. Theories of Practice. This course will meet the requirement for Seminar II for doctoral students in Homiletics and Liturgics. [3] Smith.

3452. Seminar in Medical Ethics. Explores a variety of topics and problems in Medical Ethics. Topics may include: Ethics, Law and Medicine, Health Care Delivery, Euthanasia and end of life decisions, Life before Birth, Issues in Reproductive Technologies, and Genetics and Ethics. [3]

3464. Seminar in Clinical and Research Ethics. An introduction to the central moral themes and issues arising in clinical and research settings configuring ethical understanding. Relevant historical movements in the development of modern medicine, the field of bioethics, and the realm of clinical ethics are explored as well as the contextual complexities associated with attempts to identify, articulate, and clarify the moral frameworks and values present in clinical and research settings. [3] Finder.

3465. Ethics for Human Development Professionals. This course involves a normative evaluation of ethical issues in serving human needs by examining conflicting values within moral dilemmas from a variety of theoretical perspectives and practical criteria. Students will review case studies of moral issues confronting the individual, the family, service organizations, and the general public. [3] Dokecki.

3951. Methods in Ethics. A survey of various methods, styles, and contexts under which moral philosophy has been developed and transmitted in Western thought. Topics treated are classical moral philosophy (Plato, Aristotle, Cicero), Christian sources (Augustine, Thomas Aquinas), modern philosophical ethics (Spinoza, Kant, Mill, and several twentieth century thinkers). [3] Anderson.

3952. Ethics and Public Policy. Students in this course, which is cross-listed with Vanderbilt Law School's curriculum, will explore the relationship between ethical principles and public policy decisions and analyze selected public policy issues within the framework developed in the students' reflection on ethics and the public policy process. [3] D. Welch.

3953. Seminar in Sociology of Religion. Explores a number of possible topics in the Sociology of Religion. Topics may focus on classical theorists (Weber, Troeltsch, Durkheim), the study of religious movements, popular religions, rituals and religious Experience, and the application of social scientific research methods for the study of religion. [3]

3956. Philosophical Ethics in the Western Tradition. Major thinkers, movements, and issues in the western philosophical tradition—e.g., the ethical and political thought of Aristotle and Immanuel Kant. [3] Anderson.

3957.01. Seminar in Advanced Theological Ethics: The Theology and Ethics of Stanley Hauerwas. In this advanced seminar, students will examine the theology and ethics of Stanley Hauerwas, perhaps the most influential North American Christian ethicist and contributor to contemporary discussions on the meaning of the Christian life to contemporary moral questions. [3] Anderson.

3957.02. Seminar in Advanced Theological Ethics: Catholic Moral Theology. This advanced-level seminar involves a systematic study of a major locus, problem, or thinker in theological ethics. [3] Anderson.

3960. Special Topics in Religion. [3]

3961. Special Topics in Religion. [3]

3976. Reading Course in Ethics. [1–3] Staff.

3977. Reading Course in Medical Ethics. May be repeated. [1–3]

IV. Hebrew Bible and Ancient Israel

2503. The Hebrew Bible. The life and thought of ancient Israel, with emphasis on the community's understanding of itself and of its role in history. Concentrates both on problems of historical and literary introduction and on Israelite religious practice and faith. Not available for Ph.D. credit in biblical studies. [3] Marbury.

2513. Biblical Criticism: History and Traditions. Introduction to the resources, methods, and practice of biblical interpretation, with exercises on selected texts from the Hebrew Bible and the New Testament. Knowledge of biblical languages is not required. [3] Staff.

3108. Eighth-Century Prophecy. A study of the prophetic literature against its ancient Near Eastern background; emphasis placed on the eighth-century B.C.E. prophets and on the contemporary significance of their message. [3]

3109. Exilic Prophecy. A study of Hebrew prophecy from the seventh and sixth centuries B.C.E., with emphasis on the prophets Jeremiah, Ezekiel, and Deutero-Isaiah. The work, literature, and thought associated with these great prophets are studied against the background of the events surrounding the Babylonian exile. [3] Knight.

3111. The Pentateuch. A study of the first five books of the Hebrew Bible as the key for understanding Israelite history and theology and as the base point for some of the most critical questions in the study of biblical literature. [3]

3112. Apocalyptic. A study of the early Jewish and Christian apocalyptic movements and literature. [3] Knight, Levine.

3113. Wisdom Literature in the Ancient Near East. Israel's wisdom corpus (Proverbs, Job, Ecclesiastes, Sirach, Wisdom of Solomon) in light of comparable literature from Egypt and Mesopotamia and Aramaic material. Attention to the structure of wisdom thought, to literary forms, and to traditions. [3] Azzoni.

3115. The Psalms. A study of the Book of Psalms in general, along with readings of selected Psalms in Hebrew. The course will include an analysis of the types and setting of the Psalms in the life of Israel, a discussion of the religion of the poems and their poetic form, and a survey of modern scholarship in the area. [3]

3116. Law in Ancient Israel and the Near East. The legal materials in the Pentateuch, their relation to the prophetic movement, and the role of law in ancient Israel's thought and society against the ancient Near Eastern background. [3] Knight.

3117. The Ethics of Ancient Israel. A descriptive study of the ethics of Israel, seeking to understand the effect of religion and history on the Israelites' effort to order their society and to influence moral behavior. Views of humanity, the relationship between the individual and the community, the place of politics in establishing justice, the treatment of socially vulnerable persons, and other topics. Connections drawn to such theological concepts as covenant, righteousness, and wholeness. [3] Knight.

3120. Politics and the Economy in Ancient Israel. The political and economic systems of ancient Israel, with attention to the impact of the centralized monarchic government on the economy of the country. Political processes, rights, and obligations are examined, as well as economic options, stratification, and commercial and property law. Biblical evaluations, especially prophetic critiques of the abuse of power, are explored. [3] Knight.

- 3122. Themes for Preaching from the Hebrew Bible.** Designed to help students identify within the historical, sociological, ideological, and literary frameworks of Hebrew texts relevant themes for preaching in modern settings. [3]
- 3123. The Book of Exodus.** General exegesis of the Book of Exodus, concentrating on the definition of its major themes and purposes. If necessary, additional time may be allotted for those requiring extra work in Hebrew or in textual criticism. [3]
- 3124. Esther and Ruth.** Explores the two books in the Hebrew Bible named for women. Examines Hebrew narrative technique and feminist and postmodern criticism. [3]
- 3125. Book of Genesis.** General exegesis of the Book of Genesis, concentrating on the definition of its major themes and purposes. Hebrew language not required. [3] J. Sasson.
- 3127. Cultures of Ancient Near East.** A consideration of the cultural and religious milieus of the third and second millennia B.C.E., as they shed light on Biblical origins. [3] J. Sasson.
- 3129. Book of Judges.** General exegesis of the Book of Judges, concentrating on its major themes, purpose, and narrative techniques. If necessary, additional time may be allotted for those requiring extra work in Hebrew. [3] J. Sasson.
- 3130. Book of Jeremiah.** General exegesis of the Book of Jeremiah, concentrating on its structure, major themes, purpose, and the history of ancient Judah as it is embedded in the book. [3]
- 3131. Voices of Women in the Ancient Near East.** An introductory examination of the place and portrayal of women in Near Eastern antiquity and in contemporary scholarship, with special consideration of the role genre plays in their representations. [3] Azzoni.
- 3133. Book of Job.** A study of the book of Job, attending to its literary features, religious themes, internal disputes regarding theodicy, and its relation to other texts from the region. [3] Knight.
- 3135. Sexuality in the Hebrew Bible and ANE.** Explores how various sexual practices (prostitution, homosexuality, heterosexuality, rape, sodomy, incest) are dealt with in the Hebrew Bible and in the larger context of the ANE. [3] Azzoni.
- 3139. Seminar: Book of Amos.** This seminar focuses on the meanings and messages of the rhetoric attributed to the Hebrew prophet Amos; the course will raise questions about the *Sitz im Leben* and the social context that might have given rise to such strident social critique; the seminar will devote ample attention to the stylized presentation of the prophet's voice in Hebrew poetry. Of paramount concern for the discussions will be the junctures where the prophet's rhetoric offers relevant critique for the contemporary world. [3] Marbury.
- 3142. The Old Testament in Greek.** An introduction to all aspects of the Old Testament in Greek: the origins and purpose of the LXX; its translation technique; differences between various books; Origen's *Hexapla*; the later translators Theodotion, Symmachus, and Aquila; contacts through St. Jerome and the Latin Bible; relations with the Dead Sea Scrolls; practical use of the modern editions; practice in use for textual criticism of the Hebrew Bible. Prerequisite: knowledge of Greek, together with at least an elementary knowledge of Hebrew. [3]
- 3148. The Cultures of Mesopotamia and Anatolia.** Students will consider the cultural and religious milieus of Mesopotamia and Anatolia before Alexander the Great and their relationship to the Hebrew Bible. [3] Sasson.
- 3718. The Targums.** As an introduction to the Jewish Aramaic translations and interpretations of the Hebrew Bible, the course will familiarize the student with Jewish Literary Aramaic as reflected by the various Targums and examine the different translations of the same biblical passages and different interpretative approaches. [3] Azzoni.

- 3800. The Dead Sea Scrolls.** The materials from Qumran and other locations in the Judean Desert and Jordan Valley, with reference to their contributions to the understanding of Judaism in the period 200 B.C.E. to 100 C.E. and of earliest Christianity. Open to graduate and advanced Divinity students. Prerequisite: Hebrew. [3]
- 3801. The Megillot.** Five scrolls, each a different genre of literature, are customarily read in synagogues throughout the year: Esther (Purim), Song of Songs (Passover), Ruth (Shavuot), Ecclesiastes (Sukkot), and Lamentations (Ninth of Av). We sample them and discuss them within the context of ancient Near Eastern literature. For students with at least one year of Hebrew. [3] J. Sasson.
- 3802. Exegesis Seminar.** In this seminar, students will investigate the principles, methods, and tools employed in the critical study of the Hebrew Bible including textual, historical-critical, ideological, literary, and other exegetical methods. [3]
- 3803. Ben Sira with Introduction to Mishnaic Hebrew.** Introduction into grammar and vocabulary of Mishnaic Hebrew, with practice in reading and guidance for further study. Reading of selected portions of the Hebrew text of Ben Sira. Emphasis on the experience in reading unpointed Hebrew text of this period, relevance for textual criticism, use of the Greek version, and the place of the book and its theology in the development of Israelite wisdom in general. [3]
- 3805. Job and Qoheleth.** Israelite skepticism, with emphasis on the literary form, thematic coherence, and religious viewpoint of Job and Qoheleth, interpreted within the broad spectrum of Israelite wisdom and consideration of Greek influence. [3]
- 3806. The Song of Songs.** The seminar will involve a rigorous study of the text, analyses of the literature, and inquiry regarding the religious significance and social background of the book and the role of the Song of Songs in the theology of the Hebrew Bible. Students who enroll from the Graduate Department of Religion, as well as students with proficiency in Biblical Hebrew, will have an additional class hour to concentrate on Hebrew. [3]
- 3808. Seminar: Hebrew Bible.** Reading of selected writings and critical reflection on their significance for clarifying the Hebrew Bible. Knowledge of Hebrew required. [3]
- 3809. The Sociology of Early Israel.** The nature of Israelite society, especially in its early periods, through readings in source materials and selected sociological interpretations. [3] Knight.
- 3811. Modern Interpreters of Ancient Israel.** Characteristic approaches to the history and religion of ancient Israel, as seen in selected writings by prominent scholars since the Enlightenment. Attention to the presuppositions of each scholar and to the view of Israel afforded in each study. Reading ability in German desired. Consent of instructor needed for non-Ph.D. students. [3] Knight.
- 3813. History of Ancient Israel.** Examination of the major areas of debate in the reconstruction of the history of ancient Israel and analysis of the important extra-biblical sources that have contributed to the scholarship on ancient Israel's history. The course also will address the roles that ancient Israel's Near Eastern neighbors played in the development of ancient Israel's history. [3] Azzoni.
- 3822. The Amarna Period.** The Amarna Period (sixteenth–twelfth century B.C.E.) has been a focus of research and speculation ever since excavations at the palaces and temples of Anatolia, Canaan, Assyria, and Babylon produced rich archives that illumined in remarkable detail this age, famous for its theological speculation. There were powerful personalities (Thutmose III, Suppiluliumas I, Ramses II, Aziri, Niqmaddu) who sponsored ferocious classes of empires and cultures but also led powerful drives toward peacemaking. There were enormous commercial undertakings, incredible artistic achievements, and vast spiritual thirst (Akhnaten,

Moses). Above all, there were wonderful documents—historical, theological, mythological, epistolary, legal, and belletristic—which will be examined in this course. [3] J. Sasson.

3823. Literature of the Ancient Near East. Readings in the literature from Egypt, Canaan, and Mesopotamia, with special emphasis on texts relating to the culture, literature, and thought of ancient Israel. [3] J. Sasson.

3828. Book of Daniel. Students will engage in an in-depth analysis of the Book of Daniel with particular attention to the text's historical background and literary form. The place of the Book of Daniel within Prophetic and Apocalyptic literature also will be explored. [3] Azzoni.

3829. The Book of Joshua. An exegesis of the book of Joshua, with special attention paid to literary features, issues of historiography and archaeological evidence, ideological and religious concerns and relation to other texts of the Hebrew Bible, especially the Deuteronomistic History. [3] Knight.

3880.02. Jewish Life in Persian Egypt. The Aramaic documents from the Island of Elephantine offer a unique portrayal of the life of a Jewish community in fifth century Egypt B.C.E. In this seminar, students will explore the historical and cultural implications of the documents in relationship to contemporary Biblical material. [3] Azzoni.

3881. Historiography and Ancient Israel: Chronicles. This course will examine the issues of historiography as they relate to Ancient Israel with a particular focus on the Book of Chronicles; class sessions will focus on the content of Chronicles as well as the sociohistorical contexts and methodical issues. [3]

3882. African American Biblical Hermeneutics. Surveys the field of discourse in African American biblical scholarship from its beginnings through the twenty-first century; students will analyze the work of the most prominent hermeneutics; discussions will emphasize the social and ideological currents that have contributed to the development of African American biblical hermeneutics as resistance discourse. [3] Marbury.

3960. Special Topics in Religion. [3]

3961. Special Topics in Religion. [3]

3974. Reading Course in Hebrew Bible. May be repeated. [1–3]

V. Historical Studies

2564. Martin Luther King, Jr., and the Social Roles of Religion. King's role as a religious leader and as an agent of social change, with some attention to the intellectual sources of his thought and social activism. His views concerning the social roles of religion are seen against the background of classical Christian views, late nineteenth-century dissenting traditions, the early twentieth-century American Social Gospel Movement, and the more radical ideas of Malcolm X and Albert B. Cleage, Jr., during the 1960s. Critical evaluations of King are also made in terms of classical Christian views (e.g., Aquinas, Luther, Calvin, Wesley). [3] Baldwin.

2701. The Formation of the Christian Tradition. The expansion of Christianity, the development of doctrine, relationships with the Roman Empire, development of church institutions, and changing modes of Christian life from the second century into the Middle Ages, with emphasis on the periods and themes that are formative of the classical doctrines and institutional patterns. Major purpose of the course is to establish the background for the division of the Western church and the subsequent development of the Roman Catholic and Protestant churches. [3] Burns.

2703. Christianity in the Reformation Era. The setting of the Reformation (c. 1500–1648) and its development. The significant ecclesiastical, theological, and historical issues of the period. Backgrounds and causes; examination of major individuals and ecclesiastical patterns. An understanding and interpretation of the events. Major theological documents and questions of continuing historical interest that have come out of the Reformation. [3]

2704. Modern European Christianity. Institutional and intellectual developments in European Christianity between the mid-seventeenth and the twentieth centuries. Major personalities and movements of this period. Political, social, cultural, and philosophical developments that influenced Christian existence during this time. [3]

2706. The History of Christian Liturgy. As an introduction to the origins and development of Christian worship and rituals from 100 to 1600 C.E., the course will encourage students to explore the underlying structures of different worship practices as well as the function of rituals in various times and places. [3] Jensen.

2750. The History of Religion in America. The history of the religions in America beginning with colonial religious experiments in the New World. Examines American “church history” as well as the influence of non-Christian religions in American culture. [3] Flake.

2857. Baptist History and Polity . Investigates the origins, development, and theological positions throughout the history of the Baptist tradition and examines current trends in the tradition’s polity. [3] Byrd.

3191. The History of the United Methodist Tradition. The history of United Methodism from its rise in England in the eighteenth century to the present. Forces that have shaped the movement and its impact on its own culture. Consideration of John Wesley and English Methodism (to 1790). Examination of Methodism on the American scene. [3] Meeks.

3192. Theology in the United Methodist Tradition. The history of theology in the United Methodist tradition, beginning with John Wesley and the rise of English Methodism in the eighteenth century. The major doctrinal concerns that have characterized Methodism historically and its position on several social concerns. The English scene, concluding with the death of John Wesley in 1791. The American theological tradition. [3] Meeks.

3200. Puritanism. Its rise, development, and effects, in England and America. Theology, worship, and political and social life and thought. Readings in Puritans and their interpreters. [3] Byrd.

3202. History of Christian Worship. Catholic and Protestant. Attention to the nature and principles of worship, the primitive tradition, Eastern rites, the Roman Mass, Protestant forms, and modern tendencies. [3]

3204. Religious Life in Nineteenth-Century England. The historical background of modern religious consciousness, as illustrated in Evangelicalism, the Oxford Movement, Christian Socialism, Methodism, Roman Catholicism, and other religious groups. The influence of culture, intellectual currents, and politics on religious life and thought. [3]

3207. Themes in American Christianity: Apocalypticism. Explores the apocalyptic and millennial theologies in America from the colonial period to the present. Particular attention will be given to apocalyptic and millennial ideas in relation to social and political crises in American history. [3] Byrd.

3208. Theology of Martin Luther. Explores the basic shape of Luther’s thought. Particular emphasis on the systematic interconnections of the doctrines of God, Christ, scripture, the church, and civil society, based on their relation to the central themes of justification and faith. Readings from a variety of texts in different genres. [3] DeHart.

3209. Calvin's Institutes. An examination of Calvin's great treatise and its major topics: creation, providence, and predestination; Christology and anthropology; interrelation of justification and sanctification; the sacraments; the Church and civil society. Focus on close reading of the text and its topical organization, as well as reflection on the basic issues raised by Calvin's thoughts as a whole. [3] DeHart.

3211. Roman Catholicism: French Revolution to Vatican II. Studies in modern Catholic history in Europe and America. Such topics as institutional and intellectual developments, church-state issues, and the relation between religion and culture. [3]

3212. Jesus in Modern America. The period from 1880 to 2000 featured a high level of American cultural interest in Jesus of Nazareth. More books were produced on Jesus during this period than on any other biblical figure. Through various modes of cultural production—plays, novels, movies, biblical commentaries, theologies, and moral essays—Americans depicted Jesus to meet their needs and conceptions of who this man was and what he represented for their congregations. Students will examine a wide range of “American Jesuses.” [3] Hudnut-Beumler.

3213. Women and Religion in England. The history of the engagement of women and religion in British history from the Reformation to the present. Perceptions of womanhood, debates concerning the religious foundations of such perceptions, and the way in which the arguments are used. Contributions to the subject of such diverse religious movements as the Quakers, the Evangelical revival, and the Oxford Movement. [3]

3214. Women and Religion in America. The role of women in American religious history. Topics include patterns of women's ministries, religious perceptions found in different movements or groups, contrasting experiences of women in various religious traditions, and issues of historical interpretation. [3]

3215. History and Theology in the Christian Church, Disciples of Christ. Study of the Disciples' origins and developments with particular emphasis on polity and current issues confronting the church. [3] M. Miller-McLemore.

3216. Sources of American Religious History. An introduction to primary sources of American religion and religious historiography, including works from such representative figures as Jonathan Edwards, Thomas Paine, Charles Finney, Emerson, Joseph Smith, Frederick Douglass, Walter Rauschenbush, Mary Baker Eddy, and Richard Niebuhr. [3] Flake.

3217. Church and State in American History. A study of the complex historical relationship between church and state in the United States. Particular attention is given to Colonial notions of biblical covenant and social contract; definitions of “religion” employed in American constitutional history; the design of nineteenth-century denominationalism and its influence on religious liberty; and the effects of pluralism on the shape and public expression of religion in the twentieth century. [3] Flake.

3218. America's Bibles. Students will explore the use of the Bible by American religious communities and their responses to scholarly investigation of biblical authorship and authority. Emphasis will be placed on the developments in the late nineteenth and twentieth centuries that contributed to the fundamentalist-modernist crisis in a variety of Protestant churches. [3] Flake.

3219. The Public Role of Religion. Explores the history and cultural context of the practice of ministry in American public life, as manifested in the church, the nation, and the academy. Emphasis placed on identifying the agenda and strategies for public theology in the twentieth century and plotting their trajectories for the twenty-first century. [3] Flake.

3220. Material History in American Religion. Enables students to become familiar with the use of non-textual sources to help recover the historical record, and aid in the interpretation,

of people and movements in American religious history. The first half of the seminar will consist of analysis of exemplary techniques for reading the material culture and evidence of the religious past. The second half will consist of hands-on fieldwork and interpretation of aspects of American religion such as dress, architecture, food ways, rituals, money practices, visual imagery, music, and the use of time. [3] Hudnut-Beumler.

3221. The Birth of Modern American Protestantism, 1870–1925. A review of scholarly texts related to the history of American Protestantism from the Civil War through the Progressive Era. Particular emphasis placed on the effect of science, higher criticism, professionalism, and socialism on establishment Protestantism's theology and organization. [3] Flake.

3222. Christian Mysticism. Dealing with the development of Christian practices of religious training and purification, and with the techniques of prayer for which they were undertaken, during the first six centuries. Reading and discussion of primary materials in order to discover the changing presuppositions and objectives of the practitioners. [3] Burns.

3224. Doctrine of the Savior. Study of the development of the Christian doctrine of Jesus Christ as divine and human, beginning with the New Testament, moving through the conflict over the process of salvation in the church councils, and culminating in medieval redemption theory. [3] Burns.

3226. Popular Religion. An examination of informal and unofficial practices, beliefs, and styles of religious expression that often stand in contrast or opposition to more formal ecclesiastical structures. Employs several approaches to the subject and treats examples from the seventeenth century to the present in Europe and America. [3]

3227. The Evangelical Movement in America. An examination of evangelical traditions from the colonial period to their present manifestations in twentieth century America, with some attention to the European background. Special attention is devoted to debates concerning the authority and inerrancy of scripture, theology, church-state relations, the role of the Christian in society, education, the relationship between science and religion, the church and racism, the moral character of America, and other areas of cultural cleavage. Cultural conflict or "wars of faith" between conservative black and white Christians studied in terms of their historical significance and political implications. [3] Baldwin.

3228. Catholicism since Vatican II. The Second Vatican Council has become a watermark in the Catholic Church's self-understanding (before Vatican II/after Vatican II). Examination of the last fifty years of Catholicism's history and their impact on various theological issues for the church today. [3] Burns.

3229. Seminar in Wesleyan Theology. The development of Wesley's doctrines of God, grace, and sanctification and their contribution to ecumenical theology. [3] Meeks.

3230. Religion and War in American History. An examination of complex interactions between religion and war in American history. Considers the various functions of religion in social and political crises, contrasting theological interpretations of violence, and the religious construction of national identity through warfare. [3] Byrd.

3232. The Long Reformation in Britain and America. (Also listed as History 317) How protestantism was imposed from above, received in the pew, and negotiated across the gap between the two, during the century and a half following the Reformation in England, Scotland, Anglo-Ireland, the Gaidhealtachd, and the British American colonies. Readings in anthropology of religion and of ritual supplement those in recent secondary historical literature, with a sampling of primary sources including spiritual autobiographies, diaries, church court records, and sermons. Each participant will produce a short work of original research in primary materials. [3]

3233. Theology in America, 1600–1850. Theology in America from the arrival of the Puritans through the Revolutionary period was a complex mixture of academic doctrines and popular beliefs. The scope of theological ideas extended beyond religious institutions to influence cultural patterns and social issues such as war slavery, religious persecution, and the nature of citizenship. This intermediate-level seminar examines various theologies in America, including an examination of key theologians (broadly considered) and important themes and traditions, including the Reformed Tradition, Antinomianism, political theologies, revivalism, and Deism. [3] Byrd.

3235. Twentieth-Century African American Religious History. Examines the rise of Pentecostalism, the spread of the gospel blues, how urbanization and industrialization affected black churches, the pivotal role of religion in the civil rights movement, relationship between black power and black theology, the changing roles of women in religious institutions, and the impact of post-denominationalism. [3] Dickerson.

3236. Religion and the Civil Rights Movement. Students who enroll in this course should note that the seminar carries four semester hours. The seminar will examine the religious ideas and individuals that played pivotal roles in the civil rights movement by exploring the theological foundations of the black freedom struggle, the crucial impact of religion in debates about social change, and the participation of religious institutions and organizations in an effort to achieve racial equality. [4] Dickerson.

3238. The Economy of Salvation. The elements of a theological system must fit together into a coherent explanation of the original human condition, the divine intervention in Christ, and the fullness of the Kingdom of God. Considers the interrelation of theories of sin, grace, salvation, church, and sacraments in representative Patristic theologies, including primary texts from Irenaeus, Origen, Gregory of Nyssa, and Augustine. [3] Burns.

3239. Roots of American Evangelicalism, 1770–1879. A study of the history, organizational forms, and beliefs of evangelical Christianity as it developed in America from the late colonial period through the Civil War. Particular emphasis placed on the exchange of religious ideas between Britain and America; revivalism as both a technique and a movement; source of reaction against religious enthusiasm; the South as a distinct cultural region; and the reciprocal influence of slavery and religion. [3] Flake.

3240. The Theology of Jonathan Edwards. Edwards' thought with reference to the Reformed theological tradition, the Enlightenment, and the religious ethos of colonial New England, focusing on Edwards' writings. [3] Byrd.

3249. Seminar: Colonial American Religious History. From 1492 through the American Revolution, the Western Hemisphere saw the importation of a wide range of African and European religious practices and interaction with indigenous peoples who also observed a wide range of religions. Examines the primary and secondary literature about American religion in the colonial era, with special attention to the processes of colonization, religious competition, differentiation, and innovation. [3] Hudnut-Beumler.

3250. Seminar in Church History. Variable topics. [3]

3251. The Historiography of American Religion. This course focuses on the major important interpretive accounts of the history of American Religion. The course is designed especially for graduate students who intend to specialize within, or take a doctoral exam on, the field of American religious and church history, key problems and significant monographs in the field. [3] Hudnut-Beumler, Byrd, Flake.

3254. Seminar: American Religious Innovation. The rise and development of new religious movements in nineteenth- and twentieth-century America. Emphasizes the following themes:

utopian, restorationist, and social reform movements in relation to American primitivism and political orders; the role of text and ritual in creating and maintaining religious order and community; and the problematic of the sociological categories "sect" and "cult." [3] Flake.

3261. Baptism and Eucharist in Ancient Medieval Christianity . The development of the practice and the theory of the Christian ritual of baptism and eucharist is considered. Readings include descriptions and explanations of the rituals, as well as primary texts that discuss their significance and role in the Christian Church. [3] Burns.

3269. Eucharistic Faith and Practice. *See description under Homiletics and Liturgics.*

3538. The Black Church in America. The development of the black church from the late 18th century to present. Major attention to black denominationalism, church leadership, and the involvement of the church in the social, cultural, intellectual, political, and economic areas of African American life. [3] Baldwin.

3852. Slave Thought. Students will examine the sources and content of African American slave thought by exploring the themes of God, Jesus Christ, history, the human condition, death and the afterlife, salvation, morality, ethics, Scriptures, and the role of religion in society. Attention will be directed to the sacred world of African American slaves as revealed in narratives, tales, songs, sermons, Works Progress Administration interviews, myths, aphorisms, proverbs, and magical folk beliefs. Students in the M.Div. degree program may apply this course to the requirement in African American, race, and class studies. [3] Baldwin.

3853. Graduate Seminar in Church History. Themes, issues, and approaches that have received attention in recent historical scholarship. [3]

3854. The Theology of Augustine. Development of Augustine's thought, seen against the background of philosophical currents, biblical interpretation, social and political events, and doctrinal controversies in his time. All readings available in English translation. [3] Burns.

3856. Seminar in Patristic Thought. The formation of the Christian tradition as reflected in the writings of Greek "fathers, doctors, and ecclesiastical writers," women included. [3] Burns.

3858. Thomas Aquinas. Aquinas's major theological and philosophical assertions, his conception of the two disciplines and their relationships. All readings available in English translation. [3] Burns.

3960. Special Topic: Religion and the Civil Rights Movement. [3] Dickerson.

3961. Special Topics in Religion. [3]

3978. Reading Course in European Church History. May be repeated. [1–3] Staff.

3979. Reading Course in American Church History. May be repeated. [1–3] Staff.

3980. Reading Course in Early Church History. May be repeated. [1–3] Staff.

3981. Reading Course in Historical Theology. [1–3] Staff.

3988. Reading Course in Modern European Church History. May be repeated. [1–3] Staff.

3991. Reading Course in Reformation History. [1–3] Staff.

Latin 313. Seminar: Classical Latin Prose. [3] McGinn.

VI. History and Critical Theories of Religion

2502. Aspects of World Religiosity. An introduction to the diverse modes and manners of world religiosity and to their study. Explores some of the primary forms of human religious

practice through encounters with a variety of primary and secondary sources drawn from around the world. The student will come to appreciate the variety and complexity by which homo religiosus (the human defined by religiosity) makes it through the day (and night). [3] Geller.

2505. Religious Autobiography. Considers the genre of autobiography and the roles of memory and belief in constructing narrative; students will read from the classics of Christian, Jewish, and Native American autobiographies, as well as from other religious traditions, to determine how race, class, gender, and sexuality affect the portrayal of religious experiences. [3] D. Sasson.

2567. Music and Religion. An investigation into the many ways in which religion and music contribute to community formation throughout the world. Topics include music's interdependent relationship with religious texts, religious performance, trance, sacrifice, and folk origins. [3] Barz.

3128. Jewish Messianism. [3] *See description under Jewish Studies.*

3137. Autobiography and Methodological Criticism. Considerable attention given to reading and discussing texts from across the humanities field where scholars are rethinking objectivity and exploring questions of social location, personal voice, subjectivity, and different inflections of the academic "voice." Aims to helping students experiment with different styles of academic writing and reflection in an effort to find their own voice. For graduate and advanced level students. [3] D. Sasson.

3156. Jewish and Christian Self-Definition. [3] *See description under New Testament and Early Christianity.*

3225. Ancient Origins of Religious Conflict in the Middle East. (Also listed as Classical Studies 224) Religious oppositions in the eastern Mediterranean world from the Maccabean revolt to the Muslim conquests of the seventh century; beginnings of religious militancy; challenges of monotheism to Greco-Roman civilization; conversion, persecution, and concepts of heresy and holy war in Christianity, Judaism, and Islam. [3] Drews, Wiltshire.

3303. Religious Literature in Contemporary Contexts. A wealth of literature that describes religious experience has been published during the past decade. This course will investigate writing from a variety of religious traditions, including Protestant, Catholic, Jewish, Buddhist, and Muslim. Of prime concern will be how the authors recall experiences in past communities, shape alternative practices, and construct new literary forms through which to tell their stories. We will pay close attention to how gender, race, ethnicity, sexuality, and social class influence how religion is experienced. The course will require several short response papers and one longer critical paper. [3] D. Sasson.

3304. Rabbinic Thought and Theology. [3] *See description under Jewish Studies.*

3309. Gender, Theology, and the Religious Imagination. Provides students the opportunities for exploring the influences of gender on Western theological discourse and the human religious imagination. Particular emphasis will be placed on naming the influences of gender on theological understandings of self, world, and God. Emphasis also will be placed on exploring the ways in which religious experience and community reflect gendered priorities. [3]

3311. Modern Critics of Religion. [3] *See description under Theology.*

3354. Philosophies of Classical India. This course will introduce students to the central themes of classical Indian philosophy in both Hindu and Buddhist traditions. Is Indian philosophy really a type of philosophy? Why has ancient Indian thought generally been excluded from the history of philosophy? These questions will be examined as will the nature of Indian philosophy itself. The course will then proceed to explore the varieties of Indian thought with an examination of the philosophical perspectives of the six "mainstream" schools (darsana) of Hindu thought and their interaction with the diverse forms of Buddhist

philosophy in ancient India. The topics for discussion will cover a range of epistemological and metaphysical issues of importance to these traditions; for example, the nature of the self, the relationship of consciousness and matter, creation, the nature and role of yoga, philosophical conceptions of the divine, and the status of the external world. [3] King.

3500. Religion and Culture. This course will explore the critical intersection between religion and culture in light of their relevance to past and present societies. We will examine a number of exemplary works which draw upon both historical and ethnographic approaches to the study of religion and culture. [3] Thomas.

3501. Judaism in New Testament Times. [3] *See description under Jewish Studies.*

3502. Antisemitism and Jewish Identity. [3] *See description under Jewish Studies.*

3503. The Jewish Heritage. [3] *See description under Jewish Studies.*

3505. Jewish Ethics. [3] *See description under Jewish Studies.*

3509. Introduction to the History and Critical Theories of Religion. Overview of the major thinkers and critical writings that have defined the scientific and critical study of religion. Not available for graduate credit. [3] McGregor.

3512. Buddhist Traditions. The thought, practice, and history of Buddhism from its beginnings in India, through the development of its Theravada, Mahayana, and Vajrayana traditions, to its present status in East and Southeast Asia. [3] King.

3514. Native American Religious Traditions. Religious and value meanings embedded in selected Native American religious traditions. Differences between the dominant western world view and Native American world views and sensibilities. Comparative study of the aesthetic, symbolic, and existential dimensions of these traditions with those of other religious traditions elucidates the characteristics of the experiences of reality found in Native American religions. [3]

3517. Mysticism in Islam. A survey of the origins and development of Islamic mysticism, the rise of asceticism, the development of the Sufi orders, the gradual systematization of Sufi teachings, and modern forms of Sufism. The spread of Islamic mysticism was primarily due to the teachings of great thinkers such as Ibn Arabi, Rabi'ya, al-Hallaj, Rumi, al-Ghazali, and others. No prior knowledge of Islam is required. [3] McGregor.

3518. The Qur'an and Its Interpreters. This course will focus upon the Qur'an and the Islamic tradition of interpretation through a critical examination of the treatment of the biblical prophets, Jesus, and Satan. Interpretations will be drawn from the earliest period to the modern era. Rationalist, dogmatic, Shi'i, and mystical schools of interpretation will be discussed. [3] McGregor.

3521. Religion and Ethnic Nationalism in the United States. Mythic and ritual character of ethnic nationalism, emphasizing the African American and American Jewish communities. Religious vs. racial identity, the maintenance of group boundaries vs. assimilation, and this world vs. the Promised Land. [3] Baldwin.

3522. Myth, Ritual, and Symbol. Various theories concerning myth and symbol. The specifically religious and humanistic content is sought through the study of a wide variety of myths and symbols in primitive and modern religions. [3] Geller.

3524. The Holocaust: Its Meanings and Implications. [3] *See description under Jewish Studies.*

3525. History of the Study of Religion. Examination of pivotal issues, schools, and theorists in the study of religion. [3]

3531. Religious Narrative and the Self. The construction of identity in religious autobiography: motivations (personal salvation, witness, proselytism); relationships among self, God, and religious tradition; role of memory; oral vs. written; cultural, gender, and religious differences. Readings may include Augustine, Gandhi, Malcolm X, Angelou, Wiesel. [3] Geller.

3535. Black Islam in America. Varied expressions of African American Islam beginning with the bringing of Muslims as slaves from West Africa. Developments extending from the Moorish Science Temple to the Nation of Islam, other communities, and their leaders, including Malcolm X. [3] Baldwin.

3537. The Holocaust: Representation and Reflection. [3] *See description under Jewish Studies.*

3880. Seminar: Themes in Jewish Studies. [3] *See description under Jewish Studies.*

3954. Methods in the Sociology of Religion. Explores the research methods employed in sociology: research design—including theory, hypothesis formation, and measurement; univariate and simple multivariate analyses. Qualitative methods also will be addressed, and ethical issues in human research will be examined. [3] Sandberg.

3982. Reading Course in Judaism. [1–3] *See description under Jewish Studies.*

3985. Reading Course in History and Critical Theories of Religion. May be repeated. [1–3] Staff.

Anthropology 226. Myth, Ritual, Belief: The Anthropology of Religion. Crosscultural survey of religious and ritual beliefs in the light of theories of religion. Topics include sacrifice, myth, witchcraft, divination, religious change, and millenarian movements. [3] Staff.

Anthropology 250. Shamanism and Spiritual Curing. A crosscultural inquiry into shamanism and sorcery. Examines altered states of consciousness, hallucinogens, spirit possession, and nontraditional techniques of curing. Contrasts shamanism with Western approaches to curing. Implications for religion, theories of the mind, and dream analysis. [3] Conklin.

Philosophy 211. Medieval Philosophy. Comparative study of key figures in Islamic, Jewish, and Christian philosophy as they struggle with the philosophy of logic, metaphysics, language, culture, politics, ethics, and nature. [3] Dobbs-Weinstein.

Philosophy 218. Hellenistic and Late Ancient Philosophy . (Also listed as Classics 218) Philosophical ideas of Stoics, Cynics, Epicureans, skeptics, Peripatetics, Neoplatonists, and early monotheist thinkers such as Philo, Origen, and Philoponus. [3] Staff.

Philosophy 231. Philosophy of History. Focus on alternative conceptions of time and history in Aristotle, Augustine, Kant, Hegel, Heidegger, and Benjamin. [3] Staff.

Philosophy 332. Seminar: History of Philosophy. *See Schedule of Courses* for topics.

Sociology 246. Sociology of Religion. Theories of nature, function, and structure of religion. Religion in America, including fundamentalism, the Black Church, and cults. How religion changes and is changed by secular society. [3] Staff.

VII. Homiletics and Liturgics

2706. The History of Christian Liturgy. As an introduction to the origins and development of Christian worship and rituals from 100 to 1600 C.E., the course will encourage students to explore the underlying structures of different worship practices as well as the function of rituals in various times and places. [3] Jensen.

2708. Sacred Time/Christian Liturgy. The course examines the construction of the Christian calendar (daily hours, weekly patterns, seasons, and special occasions) with attention devoted to comparative sacred cycles in other ancient religions. Students will explore the structure as well as the theory of consecrated time and its role in structuring and enacting religious practices as well as sacred story. The differences among various Christian groups will be examined, as well as the theological, social, and cultural distinctions that may explain, in part, such distinctions. [3] Jensen.

2709. Images of God in Visual Art. Considers the way visual artists of past and present have indicated and provided analogies for the Divine reality. Issues will include various religious perspectives on idolatry and iconoclasm, the place of censorship and the problems of transgressive art, and the role of art in Christian practices. [3] Jensen.

2710. Aesthetics and Spiritual Formation. Explores the nature and the role of aesthetics in theological reflection and spiritual formation. The place of the arts in the development and expression of religious faith is of central concern, as well as the definition and function of beauty and its place in human understanding and apprehension of the Divine. Readings will be drawn from such ancient and contemporary thinkers as Plato, Augustine, John of Damascus, Bernard of Clairveaux, George Steiner, and Simone Weil. Class projects will include visits to local churches and art museums. [3] Jensen.

2759. Theology of Proclamation. Reflection on the phenomena of public worship and forms of speaking the gospel. Theological issues in Christian worship; theological issues in the sacraments; the hermeneutic problem as a problem for preaching; theological understandings of proclamation. [3]

2801. Introduction to Homiletics. The course is an examination of the theologies and methods of preparing sermons from Biblical texts and an exploration of hermeneutical approaches, oral/aural skills, rhetorical strategies, narrative and connective logic; students are responsible for developing a working theology of the Word, reviewing major homiletic theories, completing exegetical assignments, skill-building exercises, sermon sketches, and sermon manuscripts; in-class preaching is required. [3] Braxton.

2802. The History of Preaching in the United States. This course will function on two levels by offering a substantive survey of preaching in the United States from the seventeenth century to the present and by examining the writings in the philosophy of history (Hegel, Nietzsche, White, and Wyschogrod) to explore the role of history in constructive ethics and practical theology; class sessions will address both sanctioned and unsanctioned preaching by women and men from multiple regions, racial and ethnic groups, social classes, and religious traditions. [3] Smith.

2803. Preaching, Worship, and Technology. As an exercise in cultural criticism of church practices, this course will incorporate writings from ethics and social theory (Adorno, Arendt, Borgman, Foucault, and Haraway) together with concrete questions in contemporary preaching and worship (PowerPoint, video, pulpit design, and cyborg preachers). [3] Smith.

2804. Preaching, Context, and Congregation. Preaching, unlike many forms of public speaking, takes place on a regular basis in specific social, cultural, and communal contexts. How can we understand what preaching does, and can do, over the course of time, in these situations? This course provides an overview of basic contextual and congregational studies literature inasmuch as this literature can help us better understand the ways in which sermons function in congregational and cultural contexts. [3] J. McClure.

3009. Modern Homiletic Theory. Homiletic theory and practice have undergone tremendous changes in the past century. This course traces developments from the deductive and propositional homiletics of the late nineteenth century, through the liberal topical and "project" method of the early twentieth century, new-orthodox and Barthian emphases, inductive

homiletics, narrative homiletics, structuralist and phenomenological models, and more recent postmodern construals of homiletic theory. Students will read and analyze sermons using these theories, and opportunity will be given to construct sermons using these methods as well. [3] J. McClure.

3010. Homiletic Analysis. Examination of method in homiletic criticism through an analysis of selected American sermons 1950–1990 and parallel literature in homiletic theory. This course will meet the requirement for Seminar I for doctoral students in Homiletics and Liturgics. [3]

3011. Preaching in the African American Tradition. The theology and styles of black preaching. Sermons of the most effective black preachers of today and yesterday. Methodologies for effective outlining, manuscript development, and use of illustrations are discussed. [3] Braxton.

3014. Advanced Homiletic Problems. Advanced seminar in which selected homiletic problems are addressed through an analysis of students' sermons. Hermeneutic approach to Hebrew scripture, preaching of eschatological texts, addressing of social issues. [3]

3025. Preaching and Social Justice. This seminar and preaching practicum explores the impact of preaching and worship on personal and social transformation. The course takes as its starting point the "brokenness" (i.e., suffering and injustice) that affects individuals and communities. Through readings, seminar discussions, sermons, and worship planning, students will receive resources for constructing a more effective ministry of healing and social transformation. [3] Braxton.

3032. Preaching Theology. In-depth exploration of the ways that theology comes to play in sermon preparation and preaching. Particular attention is given to the presence in preaching of theological methods, authorities (scripture, reason, experience, and tradition), theistic worldviews, theodicies, models of church and culture, ideas of atonement, the relationship between religions, and personal and historical eschatologies. Graduate students will be expected to do sermon analyses and/or preach twice for the class. [3] J. McClure.

3034. Preaching Paul. Theology, themes, and rhetorical strategies in the epistles, especially for parish preaching. Focus on new creation, fruits of the spirit, wisdom and folly, cross and resurrection, body metaphors, and practical strategies for developing sermons related to Pauline texts. [3] Braxton.

3038. Preaching in the Postmodern Context. Students will consider what it means to preach in a context in which the authority of the preacher and the authorities for preaching (scripture, reason, experience, tradition) become de-centered. The class will investigate the nature of cultural and intellectual postmodernism in relation to the "turn to the listener" in recent homiletics, and the role of technology, dialogue, participation, drama, collaboration, and testimony in preaching. [3] J. McClure.

3042. Preaching the Christian Year. An exploration of the formation and meaning of the seasons of the Church Year—Advent, Christmas, Epiphany, Lent, Good Friday, Easter, Pentecost, and other special days. Students analyze theological issues and present sermons for the times of the Christian Year. [3] J. McClure.

3045. Narrative, Communication, and Religious Identity. Within the religious imagination, mythical, historical, traditional, communal, ritual, homiletical, and personal narratives work together to shape communal and personal identities. This course investigates the ways in which narrative functions, especially in local religious communities, to shape, subvert, and transform human identities. [3] J. McClure.

3047. Contextual Homiletics. In this seminar, students will analyze the impact of various social identities upon the preparation, delivery, and reception of sermons. Among the social

identities which will be considered are gender, race, and ethnicity, class status, sexual identity, and physical ability. [3] Braxton.

3048. The Interdisciplinary Study of Preaching and Worship. Preaching and worship are liturgical acts involving theological, anthropological, and cultural dimensions. This seminar will invite students to consider more deeply the multidimensional nature of these acts. Within the broad framework of practical theology, the seminar will examine traditional and emerging scholarship in critical discourse analysis, ritual and performance studies, orality studies, and the impact of technological media on preaching and worship. This course will meet the requirement for Seminar II for doctoral students in Homiletics and Liturgics. [3] Braxton.

3262. Baptism and Eucharist in Ancient and Medieval Christianity. The development of the practice and the theory of the Christian ritual of baptism and eucharist considered. Readings include descriptions and explanations of the rituals, as well as primary texts that discuss their significance and role in the Christian Church. [3] Jensen.

3269. Eucharistic Faith and Practice. A historical examination of the eucharisticologies and practices of the various branches of Christendom, beginning with the early church. Major focus on contemporary understandings. [3]

3271. Worship in the Reformed Tradition. Sources and contemporary development of liturgical theology in the Reformed tradition. [1]

3426. Theories of Practice. This course will meet the requirement for Seminar II for doctoral students in Homiletics and Liturgics. [3] Smith.

3476. Developing Grounded Theories of Preaching and Worship. Most, if not all, theories of preaching and worship are logically deduced and based primarily on philosophical, theological, personal, or tradition assumptions. But what if theories were sought through the careful phenomenological, comparative, and theological analysis of a sampling of actual practices of preaching and worship? In this course, students will learn to investigate such practices with an eye to the development of grounded theories of preaching and worship. Methods of qualitative research taught in this course may be applicable to other fields of theological inquiry as well. This course will meet the requirement for Seminar I for doctoral students in Homiletics and Liturgics. [3] McClure.

3960. Special Topics in Religion. [3]

3961. Special Topics in Religion. [3]

3972. Reading Course in Homiletics. May be repeated. [1–3]

3973. Reading Course in Liturgics. May be repeated. [1–3]

VIII. Jewish Studies

2500–2501. Elementary Biblical Hebrew. This is the first course in a two-semester sequence leading to a reading knowledge of the Hebrew Bible; concentration is on the basic elements and grammatical study of the language, leading students to begin reading from the original texts. Open for credit to M.A. students only. [3–3] Staff.

2502. Aspects of World Religiosity. An introduction to the diverse modes and manners of world religiosity and to their study. Explores some of the primary forms of human religious practice through encounters with a variety of primary and secondary sources drawn from around the world. The student will come to appreciate the variety and complexity by which homo religiosus (the human defined by religiosity) makes it through the day (and night). [3] Geller.

2503. The Hebrew Bible. The life and thought of ancient Israel, with emphasis on the community's understanding of itself and of its role in history, are addressed in this course; concentration is upon both the problems of historical and literary interpretations and the Israelites' religious practices and faith. Not available for Ph.D. credit in biblical studies. [3]

2513. Biblical Criticism: History and Traditions. Introduction to the resources, methods, and practice of biblical interpretation, with exercises on selected texts from the Hebrew Bible and the New Testament. Knowledge of biblical languages is not required. [3] Staff.

2514–2515. Elementary Modern Hebrew. Introduction to alphabet, the basics of grammar, and elementary conversation. Spring: greater emphasis on conversation and grammar. Open for credit to M.A. students only. [3–3] Staff.

2567. Music and Religion. An investigation into the many ways in which religion and music contribute to community formation throughout the world. Topics include music's interdependent relationship with religious texts, religious performance, trance, sacrifice, and folk origins. [3] Barz.

2750. The History of Religion in America. The history of the religions in America beginning with colonial religious experiments in the New World. Examines American "church history" as well as the influence of non-Christian religions in American culture. [3] Flake.

2814. Religion and Society. Examination of religion as a social phenomenon. Explores the writings of classical sociologists (especially Marx, Weber, and Durkheim). Readings in the areas of social theory, cultural analysis, and sociology of religion. Focus on the use of sociological insights toward understanding the relation between religion and Western social life. [3]

2815. Religion and Social Movements. *See description under Ethics and Society.*

3061. Post-Freudian Theories of Religion. The seminar involves a critical exploration of the Object Relations School of contemporary psychoanalysis (M. Klein, D. Winnicott, W. R. Fairbairn, Otto Kernberg, Heinz Kohut) and focuses on both the clinical and the explanatory theories as they relate to the examination of the religious experience and similar self states. [3] Gay.

3101. Readings in Biblical Hebrew. A reading course in selected texts of the Hebrew Bible for students who have taken 2500–2501 or its equivalent. [1] Staff.

3102–3103. Intermediate Modern Hebrew. Modern Hebrew reading, conversation, and advanced grammar. Spring: greater emphasis on reading and writing. Prerequisite: one year of Modern Hebrew or its equivalent. [3–3] Staff.

3108. Eighth-Century Prophecy. A study of the prophetic literature against its ancient Near Eastern background; emphasis placed on the eighth-century B.C.E. prophets and on the contemporary significance of their message. [3]

3109. Exilic Prophecy. A study of Hebrew prophecy from the seventh and sixth centuries B.C.E., with emphasis on the prophets Jeremiah, Ezekiel, and Deutero-Isaiah. The work, literature, and thought associated with these great prophets are studied against the background of the events surrounding the Babylonian exile. [3] Knight.

3111. The Pentateuch. A study of the first five books of the Hebrew Bible as the key for understanding Israelite history and theology and as the base point for some of the most critical questions in the study of biblical literature. [3] Staff.

3112. Apocalyptic. A study of the early Jewish and Christian apocalyptic movements and literature. [3] Knight, Levine.

3113. The Wisdom Literature in the Ancient Near East (ANE). Israel's wisdom corpus (Proverbs, Job, Ecclesiastes, Sirach, Wisdom of Solomon) in light of comparable literature

from Egypt and Mesopotamia. Attention to the structure of wisdom thought, to literary forms, and to traditions. [3] Azzoni.

3115. The Psalms. A study of the Book of Psalms in general, along with readings of selected Psalms in Hebrew. The course will include an analysis of the types and setting of the Psalms in the life of Israel, a discussion of the religion of the poems and their poetic form, and a survey of modern scholarship in the area. [3]

3123. The Book of Exodus. General exegesis of the Book of Exodus, concentrating on the definition of its major themes and purposes. If necessary, additional time may be allotted for those requiring extra work in Hebrew or in textual criticism. [3]

3124. Esther and Ruth. Explores the two books in the Hebrew Bible named for women. Examines Hebrew narrative technique and feminist and postmodern criticism. [3] Staff.

3125. Book of Genesis. General exegesis of the Book of Genesis, concentrating on the definition of its major themes and purposes. Hebrew language not required. [3] Sasson.

3127. Cultures of Ancient Near East. A consideration of the cultural and religious milieus of the third and second millennia B.C.E., as they shed light on Biblical origins. [3] Sasson.

3128. Jewish Messianism. A study of messianism and messianic movements in Jewish history in the common era, including contemporary manifestations in Europe, Israel, and North America. [3] Sasson.

3129. Book of Judges. General exegesis of the Book of Judges, concentrating on its major themes, purpose, and narrative techniques. If necessary, additional time may be allotted for those requiring extra work in Hebrew. [3] Sasson.

3133. Book of Job. A study of the book of Job, attending to its literary features, religious themes, internal disputes regarding theodicy, and its relation to other texts from the region. [3] Knight.

3135. Sexuality in the Hebrew Bible and ANE. Explores how various sexual practices (prostitution, homosexuality, heterosexuality, rape, sodomy, incest) are dealt with in the Hebrew Bible and in the larger context of the ANE. [3] Azzoni.

3148. The Cultures of Mesopotamia and Anatolia. Students will consider the cultural and religious milieus of Mesopotamia and Anatolia before Alexander the Great and their relationship to the Hebrew Bible. [3] Sasson.

3156. Jewish and Christian Self-Definition. A study of the various options (social, theological, scriptural, practical) facing Jews and Christians in the first three centuries C.E. and of the processes by which the various communities narrowed those options in their attempts to establish a normative identity. [3] Levine.

3169. Feminist Interpretations of Scripture. Examination of the representations of women, religious and ethnic "others," and sexuality in biblical and contemporary noncanonical (ANE, Pseudepigrapha, Gnosticism) texts, utilizing various approaches (literary, historical, anthropological, ideological, Womanist, Mujerista). [3] Levine.

3216. Sources of American Religious History. An introduction to primary sources of American religion and religious historiography, including works from such representative figures as Jonathan Edwards, Thomas Paine, Charles Finney, Emerson, Joseph Smith, Frederick Douglass, Walter Rauschenbush, Mary Baker Eddy, and Richard Niebuhr. [3] Flake.

3217. Church and State in American History. A study of the complex historical relationship between church and state in the United States. *See description under Historical Studies.*

3218. The Bible in American Religious History. *See description under Historical Studies.*

3225. Ancient Origins of Religious Conflict in the Middle East. Religious oppositions in the eastern Mediterranean world from the Maccabean revolt to the Muslim conquests of the seventh century; beginnings of religious militancy; challenges of monotheism to Greco-Roman civilization; conversion, persecution, and concepts of heresy and holy war in Christianity, Judaism, and Islam. [3] Drews, Wiltshire.

3226. Popular Religion. An examination of informal and unofficial practices, beliefs, and styles of religious expression that often stand in contrast or opposition to more formal ecclesiastical structures. Employs several approaches to the subject and treats examples from the seventeenth century to the present in Europe and America. [3]

3303. Religious Literature in Contemporary Contexts. This course will introduce recent literature that describes religious experience from a variety of religious traditions, including Christian, Jewish, Buddhist, and Muslim. Of prime concern will be how the authors recall experiences in past communities, shape alternative practices, and construct new literary forms through which to tell their stories. Readings may include Marilynne Robinson, *Gilead*; Richard Rodriguez, *The Hunger for Memory*; Kim Barnes, *In the Wilderness*; Paul Cowan, *An Orphan in History*; Julia Kasdorf, *The Body and the Book*; Kathleen Norris, *The Cloister Walk*; and Mary Rose O'Reilly, *The Barn at the End of the World: The Apprenticeship of a Quaker, Buddhist Shepherd*. [3] D. Sasson.

3304. Rabbinic Thought and Theology. The Hebrew Bible, though foundational to traditional Judaism, is not central. Traditional Judaism is the heir of Rabbinic Judaism, which emerged from the academics of the Land of Israel and Babylonia in the first through seventh centuries of the Common Era. We will focus on the Rabbinic texts that helped define Judaism for over a thousand years in the post-Temple environment. Rabbinic Judaism constitutes a revolution in religiosity, and the weapon of the revolution was the midrash, or the creative Rabbinic rereadings of the Torah. Together we will explore both the messages and the methods of Rabbinic Judaism. [3]

3311. Modern Critics of Religion. An examination of the relationship between the critique of religion and the understanding of modernity. Focus on the writings of Feuerbach, Kierkegaard, Marx, Nietzsche, and Freud. [3] Geller.

3322. Theology of World Religions. The recent interreligious dialogue and its implications for Christian theology. The way in which global religious pluralism affects the nature and task of theology and the relation among major world religions as claims to truth. [3]

3335. Religious Language. Symbol, metaphor, and analogy in literary theory, linguistic analysis, and theology. [3]

3342. Feminist Hermeneutics. The revisionary interpretation feminists are currently proposing in such areas as literary theory, anthropology, psychology, ethics, and philosophy and their possible effect on contemporary theology and biblical analysis. [3]

3400. Social Ethics. See description under *Ethics and Society*.

3410. Political Ethics. See description under *Ethics and Society*.

3412. Ethics and Society. See description under *Ethics and Society*.

3419. Twentieth-Century North Atlantic Ethics. See description under *Ethics and Society*.

3501. Judaism in New Testament Times. The varieties of Judaism that emerged from 200 B.C.E. to approximately 200 C.E. Discussions of the Maccabees, the politics and religion of the Hasmonean dynasty, the Dead Sea Scroll community at Qumran, the Sadducees, Pharisees and Essenes, Philo, the early church and early rabbinic Judaism all placed in their Hellenistic and Roman contexts. Major themes in the development of Messianism and Apocalypticism. [3]

3502. Antisemitism and Jewish Identity. A historical and cultural analysis of the dilemmas Jewish emancipation presented to both Jews and non-Jews, examined through the study of a variety of popular and elite cultural representations of Jews. How antisemitism became entangled with the problems of gender, sexual, racial, class, and self identity. [3] Geller.

3503. The Jewish Heritage. A survey of Jewish history and literature for a better understanding of Jesus' Jewish roots and its important foundation of both Christianity and Islam. Sponsored by the Jewish Chautauqua Society. [3]

3505. Jewish Ethics. By tracing environmental issues through the Bible, Talmud, medieval codes and mystical texts, we will analyze how contemporary Jewish environmentalists are using these traditional sources to further their own agendas. The course will be two-pronged: (1) understanding the primary genres of Jewish law and ethics as well as the mechanisms of Jewish legal development, and (2) analyzing the specific issues involved in Judaism's complicated relationship to the environment. [3]

3509. Introduction to the History and Critical Theories of Religion. *See description under History and Critical Theories of Religion.*

3522. Myth, Ritual, and Symbol. Various theories concerning myth and symbol. The specifically religious and humanistic content is sought through the study of a wide variety of myths and symbols in primitive and modern religions. [3] Geller.

3524. The Holocaust: Its Meanings and Implications. This course examines the systematic destruction of the European Jewish communities during World War II and the historical, social, political, and cultural developments that led to the destruction. During the class sessions, students will explore the psychological and sociological dimensions of the Holocaust's aftermath and the philosophical and theological problems the event presents for both Jews and Christians. [3] Geller.

3525. History of the Study of Religion. Examination of pivotal issues, schools, and theorists in the study of religion. [3]

3530. Comparative Studies in Religion. Comparison of various religions focused on themes such as God, the human condition, history, salvation, ethics, scriptures, and religious communities, using materials from the world's religions, East and West, past and present. [3] (Not currently offered)

3531. Religious Narrative and the Self. The construction of identity in religious autobiography: motivations (personal salvation, witness, proselytism); relationships among self, God, and religious tradition; role of memory; oral vs. written; cultural, gender, and religious differences. Readings may include Augustine, Gandhi, Malcolm X, Angelou, Wiesel. [3] Geller.

3537. The Holocaust: Representation and Reflection. Explores fundamental questions about the nature of history and representation, the nature of the human and the divine, that the Holocaust raises. Prerequisite: 3524 or its equivalent. [3] Geller.

3800. The Dead Sea Scrolls. The materials from Qumran and other locations in the Judean Desert and Jordan Valley, with reference to their contributions to the understanding of Judaism in the period 200 B.C.E. to 100 C.E. and of earliest Christianity. Open to graduate and advanced Divinity students. Prerequisite: Hebrew. [3] Hunt.

3801 The Megillot. Five scrolls, each a different genre of literature, are customarily read in synagogues throughout the year: Esther (Purim), Song of Songs (Passover), Ruth (Shavuot), Ecclesiastes (Sukkot), and Lamentations (Ninth of Av). We sample them and discuss them within the context of ancient Near Eastern literature. For students with at least one year of Hebrew. [3] J. Sasson.

3802. Exegesis of the Bible. Students will explore the principles, methods, and tools used in the critical study of the Hebrew Bible, including textual, historical-critical, ideological, literary, and other exegetical methods. [3] Knight, Hunt.

3803. Ben Sira with Introduction to Mishnaic Hebrew. Introduction to grammar and vocabulary of Mishnaic Hebrew, with practice in reading and guidance for further study. Reading of selected portions of the Hebrew text of Ben Sira. Emphasis on experience in reading unpointed Hebrew text of this period, relevance for textual criticism, use of the Greek version, and the place of the book and its theology in the development of Israelite wisdom in general. [3] Azzoni.

3805. Job and Qoheleth. Israelite skepticism, with emphasis on the literary form, thematic coherence, and religious viewpoint of Job and Qoheleth, interpreted within the broad spectrum of Israelite wisdom and consideration of Greek influence. [3] Staff.

3806. The Song of Songs. The seminar will involve a rigorous study of the text, analyses of the literature, and inquiry regarding the religious significance and social background of the book and the role of the Song of Songs in the theology of the Hebrew Bible. Students who enroll from the Graduate Department of Religion, as well as students with proficiency in Biblical Hebrew, will have an additional class hour to concentrate on Hebrew. [3] Hunt.

3807. Proverbs. Analysis of the Book of Proverbs, with emphasis upon translation, themes, and literary features and the function of aphorisms and instructions in the ancient Near East. [3]

3808. Seminar: Hebrew Bible. Reading of selected writings and critical reflection on their significance for clarifying the Hebrew Bible. Knowledge of Hebrew required. [3]

3809. The Sociology of Early Israel. The nature of Israelite society, especially in its early periods, through readings in source materials and selected sociological interpretations. [3] Knight.

3811. Modern Interpretations of the Hebrew Bible. Characteristic approaches to the history and religion of ancient Israel, as seen in selected writings by prominent scholars since the Enlightenment. Attention to the presuppositions of each scholar and to the view of Israel afforded in each study. Reading ability in German desired. Consent of instructor needed for non-Ph.D. students. [3] Knight.

3812. Postexilic Literature and Theology. The literary heritage of ancient Israel from about 538 B.C.E. to 165 B.C.E. Attention to postexilic portions of the book of Isaiah; Haggai; Zechariah; Malachi; I and II Chronicles; Ezra-Nehemiah; Ruth; Esther; Song of Songs; Daniel. The variety of theological perspectives found in this period of Israel's history and the character of religious thought prior to the Maccabean period. [3]

3813. History of Ancient Israel. Examination of the major areas of debate in the reconstruction of the history of ancient Israel and analysis of the important extra-biblical sources that have contributed to the scholarship on ancient Israel's history. The course will also address the roles that ancient Israel's Near Eastern neighbors played in the development of ancient Israel's history. [3] Azzoni.

3816. Advanced Hebrew. Reading of selections from the Hebrew Bible, with emphasis on syntax and text criticism. Prerequisite: Elementary Biblical Hebrew. [3] Knight.

3818. Aramaic. Vocabulary, forms, and syntax of Aramaic through reading of the Aramaic sections of Daniel and Ezra and of specimens of material from the Elephantine papyri, the Targums, etc. Prerequisite: 3816. [3] Azzoni.

3819. The Targums. An introduction to the Jewish Aramaic translations and interpretations of the Hebrew Bible. The course will aim at familiarizing students with Jewish Literary Aramaic as reflected by the various Targums. Furthermore, by examining different translations of the same biblical passage, different interpretative approaches will be highlighted. [3] Azzoni.

3823. Literature of the Ancient Near East. Readings in the literature from Egypt, Canaan, and Mesopotamia, with special emphasis on texts relating to the culture, literature, and thought of ancient Israel. FALL. [3] Sasson.

3828. Book of Daniel. An in-depth analysis of the Book of Daniel, with particular attention to the text's historical background and literary form. The place of the Book of Daniel within Prophetic and Apocalyptic literature will also be explored. [3] Azzoni.

3880.01. Jewish Identity in the Modern Period. Considers how Jewish thinkers at the end of the nineteenth century and early twentieth century addressed the question of individual and collective identity by examining the cultural, political, and religious definitions of modern Jewish identity, the role of the reinvention of national myths, the "Jewry of muscles," the "new Hebrews," and the Zionism myth narratives in Zionism. [3] Urban.

3880.03. Seminar: Judaism and the Problem of Evil. Investigates the explanation for the origin, nature, and representations of evil from Scripture through the Hasidic masters as well as the reflections of modern thinkers. [3] Urban.

3880.04. Seminar: Zionism and Its Critics. History of the Zionist idea from the nineteenth century focusing on ideological, cultural, and religious issues and examining criticism from within and without the movement. [3] Urban.

3880.05. Postmodern Theory: In the Wake of the Death of God. [3] Franke.

3881. Historiography and Ancient Israel: Chronicles. Examines issues of historiography as they relate to Ancient Israel with a particular focus on the Book of Chronicles. Focuses on the content of Chronicles as well as sociohistorical contexts and methodological issues. Ph.D. students will do an extra session with the Hebrew text. [3] Hunt.

3923. God in the Western Tradition. The major philosophical and theological texts of the Western tradition from Plato to the twentieth century. The changing history of the interpretation of God from Christian neoplatonism to nineteenth- and twentieth-century challenges of classical approaches. [3]

3953. Seminar in Sociology of Religion. Explores a number of possible topics in the Sociology of Religion. Topics may focus on classical theorists (Weber, Troeltsch, Durkheim), the study of religious movements, popular religions, rituals and religious Experience, and the application of social scientific research methods for the study of religion. [3]

3982. Reading Course in Judaism. May be repeated. [1–3] Staff.

Anthropology 226. Myth, Ritual, Belief: The Anthropology of Religion. Crosscultural survey of religious and ritual beliefs in the light of theories of religion. Topics include sacrifice, myth, witchcraft, divination, religious change, and millenarian movements. [3] Staff.

Anthropology 263. Myth and Legend: The Anthology of Oral Tradition. Narrative traditions and folklore of Western and non-Western cultures. Myths of world creation, human origins, and transformation. Relationship of myth to dream, historical narrative, and social organization. Myth telling and performance. The structure and theory of myth. [3] Staff. (Not currently offered)

Anthropology 265. Psychological Anthropology. How personality and culture affect each other. Socialization and the life cycle, the definition of sex roles, individual psychology and group aggression, religion and group personality, and the nature of mental illness and normalcy in non-Western societies. [3] (Not currently offered)

Anthropology 284. Problems in Anthropological Theory. An advanced seminar in anthropological theory: cultural evolution, cultural history, ethnic relations, cultural ecology, archaeological method and theory, social structure, political organizations, religious institutions. [3]

Anthropology 310. Archaeological Method and Theory. Development of archaeology as a discipline; relationships with anthropology and history; intellectual trends. Prerequisite: consent of instructor. [3] (Not currently offered)

Anthropology 315. Seminar in Anthropological Theory: History, Themes, and Current Issues. An advanced consideration of the history of anthropological theory and recent issues and controversies. Emphasis on theories of cultural evolution and development of complex societies. Dialectical exploration of ideas requires each student to argue contrasting perspectives. [3] (Not currently offered)

Anthropology 322. Culture, Structure, Personality. Integrative anthropological approaches to human behavior examining symbolism, values, the organization of the group, interaction and psychology. [3] (Not currently offered)

Art History 241. American Art 1865 to 1945. Painting and sculpture of the United States between the Civil War and the Second World War with emphasis on iconography, social history, class, and gender. [3] Fryd.

Art History 242. Art since 1945. A survey of art produced in the United States and Europe since 1945 with emphasis on theory and social and intellectual factors. [3] Fryd.

Art History 301. The Methods of Art History . Comparative analysis of art historical methods including social history, post-structuralism, feminism, gender studies, stylistic analysis, and iconography. Assessment of methods in action through critiques and exercises in independent application. [3] Folgarait, Fryd.

Classical Studies 209. Greece and the Near East from Alexander to Theodosius. From Alexander's conquest of the Persian Empire to the ascendancy of Christianity in the late fourth century. Emphasis on social, cultural, and religious transformations, within the framework of political history. [3]

Comparative Literature 330. Seminar in the Enlightenment and Its Literary Connections. FALL. [3] McCarthy.

Comparative Literature 360. Philosophy and Literature. Problems and methodological issues inherent to the study of these two disciplines. [3]

English 232a–232b. Twentieth Century American Novel. Explorations of themes, forms, and social cultural issues shaping the works of American novelists. Authors may include Fitzgerald, Faulkner, Hemingway, Hurston, Ellison, McCarthy, Bellows, Kingston, Morrison, and Pynchon. 232a: emphasizes writers before 1945; 232b emphasizes writers after 1945. FALL, SPRING. [3–3] Bell, Chen.

English 268a. America on Film: Art and Ideology. American culture and character through film, film theory, and literature. [3] Girgus.

English 278. Colonial and Post-Colonial Literature. Literature from countries colonized by Europe from eighteenth to twentieth century. Examines implications of colonial encounter and formation of "post-colonial" culture and such issues as language, agency, gender roles, and relation between power and narrative. Such authors as Forster, Coetzee, Okri, Tagore, Chatterjee, Kincaid, Rushdie, Soyinka. [3] Barsky.

English 288. Special Topics: Jewish American Literature. [3] Schachter.

European Studies 225. European Realism. [3] McCarthy.

German 221. German Culture and Literature. [3] Setje-Eilers.

German 241. The Racial Imagination. The complex and contradictory history of the idea of "race" as a scientific category. Study of medical, scientific, philosophical, anthropological, and literary texts. No German required. [3] Eigen.

German 269. Writing under Censorship. An introduction to the main literary trends and authors of the former East Germany (1949–1989). [3] (Not currently offered)

German 270. German Film. A survey of the German film with special attention to its socio-cultural context and to pertinent theories of photography and of cinematic narration. No knowledge of German required. [3] Sevin.

German 271. Women at the Margins: German-Jewish Women Writers. Examination of themes, forms, and sociocultural issues shaping the work of German-Jewish women writers from the Enlightenment to the present. Readings and discussions in English. [3] Werner.

German 273. Nazi Cinema: The Manipulation of Mass Culture. Nazi manipulation of mass culture through film (propaganda, musicals, westerns). Some comparison with American film of the era, additional examination of “fascist” aesthetic legacy in American culture today. No German required. [3] Eigen.

German 274. Who Am I? German Autobiographies. No other literary genre is as apt to work through this question as autobiography. In this course, students will read both canonical and non-canonical and rather unknown texts in order to explore a wide range of possibilities of how authors managed to construct cultural, religious, and gender identities. (In German) [3] Hahn.

German 340. Beyond Good and Evil. Emergence of and complexity in literature against the backdrop of Nietzsche's *Beyond Good and Evil* (1886), E. O. Wilson's *Consilience* (1998), P. Cillier's *Complexity and Postmodernism* (1998); “beyond good and evil” as a catch phrase of modern decenteredness in such works as *Notes from Underground*, *Mysterious Stranger*, *The Tin Drum*. [3] McCarthy.

German 351. Philosophical Backgrounds of German Literature. Survey of German philosophical thinking from Leibnitz to Nietzsche and its importance for German literature from Goethe to Hesse. [3] McCarthy.

History 231. History of Germany in the Twentieth Century. The turbulent history of Germany, as it went from authoritarian state to volatile democracy, to National Socialist dictatorship, to divided country, and to reunification. Special emphasis placed on the Nazi dictatorship, its origins and legacy. No credit for students who have completed 230b. [3] Smith. (Not currently offered)

History 235. Modern France. From the French Revolution of 1789 to the present. Emphasis on politics, with some attention to the major economic, social, cultural, and intellectual developments. [3] Ramsey.

History 237. Russia: Tsardom to Empire. Russian history from fifteenth-century Muscovite state, society, and economy; orthodox Russian culture and religion; Peter the Great and Catherine the Great; eighteenth century absolutism, empire, serfdom, and intellectual life. [3] Wcislo. (Not currently offered)

History 238. Russia: Old Regime to the Revolution. [3] Wcislo.

History 245. Victorian England. Cultural values, liberal reform, urbanization, women and gender, imperialism. [3] Epstein. (Not currently offered)

History 255. Islamic World to 1798. [3] Messier.

History 256. Nationalism and Islam in the Middle East since 1798. Secular nationalism and the changing nature of Islamic identification in the Middle East with emphasis on Egypt, Turkey, Iran, and Palestine/Israel. [3] Longwell.

History 257. Muhammad and Early Islam. Early Arabian society, Judaism and Christianity in Arabia, Muhammad and the birth of Islam, the conquests, Islamization, Arabization, Jewish influences in early Islam, the medieval Islamic world. [3] Wasserstein.

History 277. The New South. The aftermath of war and emancipation and the era of Reconstruction; social change and dislocation in the late nineteenth century; the Populist Revolt; the origins of segregation and one-party politics; twentieth-century efforts to modernize the region; the economic, political, and Civil Rights revolutions of the mid-twentieth century; the South in modern American society and politics. [3] Carlton.

Jewish Studies 246. Berlin and Jewish Modernity. Rise of Jewish modernism presented by Jewish writers in Germany from 1900 to 1933. [3] Urban.

Jewish Studies 252. Social Movements and the Jewish Polity . How social movements shape contemporary American Jewish culture and politics. Explores movements internal to Judaism and those bringing religion into the public sphere. [3] Kelner.

Philosophy 211. Medieval Philosophy. Comparative study of key figures in Islamic, Jewish, and Christian philosophy as they struggle with the philosophy of logic, metaphysics, language, culture, politics, ethics, and nature. [3] Goodman. (Not currently offered)

Philosophy 218. Hellenistic and Late Ancient Philosophy . Philosophical ideas of Stoics, Cynics, Epicureans, skeptics, Peripatetics, Neoplatonists, and early monotheist thinkers such as Philo, Origen, and Philoponus. [3] (Not currently offered)

Philosophy 231. Philosophy of History. Focus on alternative conceptions of time and history in Aristotle, Augustine, Kant, Hegel, Heidegger, and Benjamin. [3] Staff. (Not currently offered)

Philosophy 232. Critical Theory: Benjamin and Adorno. [3] Dobbs-Weinstein.

Philosophy 240. Aesthetics. The leading accounts of the nature of art, the character of aesthetic experience, the nature of artistic creation, and selected problems associated with art in specific media. [3] Neufeld.

Philosophy 242. Philosophy of Religion. A study of various problems concerning religious experiences; ideas about religion and divinity. [3] Tlumak.

Philosophy 243. Philosophy of Film. Challenges posed by film forms to traditional aesthetics and the novel philosophical approaches created to deal with them. Topics include the nature of the film image, film and experiential time, cinematic genres, the problem of mass art, and feminist critiques of spectatorship. Weekly screenings. [3] (Not currently offered)

Philosophy 245. Humanity, Evolution, and God. The impact of the idea of evolution on our conception of personhood. Theistic and non-theistic approaches to philosophical anthropology, ethics and society, the theory of knowledge, the mind-body problem, and relations with the environment and other species. [3] Goodman. (Not currently offered)

Philosophy 258. Contemporary Political Philosophy. The emergence of post-liberal political thought. Topics include the politics of recognition, the specificity of political action, transformations in political theory as a consequence of gender, race, and environmental issues. These will be studied through examination of the writings of Hannah Arendt, Heidegger, Derrida, Habermas, etc. [3] Staff. (Not currently offered)

Philosophy 260. Twentieth-Century Continental Philosophy. A study of selected twentieth-century philosophers such as Derrida, Foucault, and Lacan. [3] Wood.

Philosophy 294b. Selected Topics: Forms of and Responses to Evil. Study of changes in our understanding of evil from the Book of Job through the 1755 Lisbon earthquake to the Holocaust and September 11, and of various individual and collective responses to evil. Centrally invoked philosophical materials will be enriched with religious, psychological, and artistic perspectives. [3] Tlumak.

Philosophy 330. Seminar in Philosophy: History of Philosophy. Spinoza. FALL. [3] Dobbs-Weinstein.

Political Science 230. Middle Eastern Politics. [3] Carroll.

Political Science 246. Religion and Politics in the United States. The historical and contemporary impact of religion on political culture, coalitions, and behavior in the United States. The vitality of religion in American society and its political consequences. The evolution of church-state relationships. [3] (Not currently offered)

Sociology 246. Sociology of Religion. Theories of nature, function, and structure of religion. Religion in America, including fundamentalism, the Black Church, and cults. How religion changes and is changed by secular society. [3] Pitt.

Sociology 255. Racial and Ethnic Minorities in the United States. Status of blacks, Asians, Hispanics, and other minorities. Migration, identity, and association, and strategies to improve group status and reduce intergroup tensions. Comparisons to other countries. [3] (Not currently offered)

IX. New Testament and Early Christianity

2511. The New Testament. How the New Testament shows the main characteristics of early Christianity as compared and contrasted with early Judaism and with Hellenistic religions. Religious authority in early Christian communities and the types of faith and ethics found within the New Testament traditions. Not available for Ph.D. credit in biblical studies. [3] Segovia.

2513. Biblical Criticism: History and Traditions. Introduction to the resources, methods, and practice of biblical interpretation, with exercises on selected texts from the Hebrew Bible and the New Testament. Knowledge of biblical languages is not required. [3] Staff.

2516. Early Christian Women. This course explores the roles and authority of women in early Christian communities. Beginning with the New Testament writings, there is conflicting evidence regarding the participation of women. Some language suggests a prohibition of women as leaders and teachers; other texts provide evidence of women who performed these roles. A variety of texts from the first four centuries of Christianity, from Asia Minor to Egypt, show a similar discrepancy. The course will focus on laying out the evidence for women's participation and then assessing the implications of that evidence. [3] Hylen.

3035. Paul and Politics. Paul formed his gospel in the cauldron of an apocalyptic theology that mingled religion and politics. This volatile mixture produced a provocative counter-claim to Roman imperial culture. This seminar will explore Paul's responses to pressing religious and political issues of his time such as Roman imperialism, slavery, the role of women, ethnic reconciliation, and sexual identity. Additionally, the seminar will examine the enduring role of Paul's letters in contemporary conversations around cultural and political issues. Advanced M.Div. and M.T.S. students must receive the permission of the instructor. [3] Braxton.

3150. Lives of Jesus: Ancient and Modern. An exploration of ancient and modern interpretations of the story of Jesus to see the ways in which generations of Christians have told this story to fit the needs of their own particular settings and cultures. [3] Levine.

3151. Jesus and the Early Christian Communities. How the Gospel writers present the traditions about Jesus in response to historical problems and religious questions current in first-century communities. The relation of the Jesus of history to the Gospel portrayals. Prerequisite: 2511, or its equivalent. [3] Levine.

3152. Interpreting the Gospels. The Gospels through history and cultures. A survey of their interpretations from their original historical contexts, through the history of the church, and more recently in Catholic and Protestant churches after the Holocaust, in African-American churches, and in feminist circles. [3] Patte.

3154. Gospel According to Luke. Exploration of Luke's compositional techniques, possible sources, Christology, community formation, and ethics, utilizing a variety of approaches (socio-historical, literary, ideological, feminist). Knowledge of Greek required. [3] Levine.

3156. Jewish and Christian Self-Definition. Students will examine the various options (social, theological, Scriptural, practical) that confronted Jews and Christians in the first three centuries of the Common Era and the processes by which the various communities narrowed these options in their attempts to establish a normative identity. [3] Levine.

3160. Synoptic Studies. Introduction to basic issues of synoptic research and methodology, with an emphasis on the message and theology of the individual evangelists. [3] Patte.

3161. The Parables in Exegesis and Interpretation. The nature of parable as form; the history of the interpretations of parables; the study of parables in the setting of the ministry of Jesus and the theology of the Evangelists; and literary criticism and the interpretation of the parables. [3] Levine, Buttrick.

3162. The Pauline Interpretation of Christianity. Pauline Christianity and its place in the early church, using the letters of Paul, the deuter-Pauline letters, and the portrait of Paul in Acts. Attention to the problems of method. Greek not required. [3] Patte.

3163. Exegesis of Selected Pauline Letters. Selected Pauline letters are the base from which the character and content of Pauline theology are explored. The development of basic skills in exegesis is emphasized. [3] Patte.

3164. The Johannine Literature. Exegesis of selected passages of the fourth gospel, with emphasis on the major Johannine themes and symbology. [3] Segovia.

3165. Matthew. Through analytical approaches such as historical-critical, literary, sociological, and ideological, students will reconstruct Matthew's audience, both actual and ideal, and explore the topics of Christology, ecclesiology, debates with the synagogue, politics, and artistry of composition. [3] Levine.

3166. The Problem of Biblical Authority. A study of controversies over the authority of Scripture. Various uses of Scripture to clarify doctrinal statements about Scripture and revelation. Comparison of the views of Scripture held in early Palestinian Judaism, New Testament Christianity, selected periods of church history, contemporary evangelical and liberal circles, the Black church, and secular culture. [3] Patte.

3167. History of Reception of the New Testament and Exegesis. Selected instances of the reception of New Testament texts throughout the history of the Church and today, in the East and the West, in the "first" and in the "two-thirds" world, by religious and secular readers as well as by biblical scholars. Special attention to the interface of these diverse readings and of contemporary critical interpretations. [3] Patte.

3169. Feminist Interpretations of Scripture. Examination of the representations of women, religious and ethnic "others," and sexuality in biblical and contemporary noncanonical (ANE, Pseudepigrapha, Gnosticism) texts, utilizing various approaches (literary, historical, anthropological, ideological, Womanist, Mujerista). [3] Levine.

3173. The Book of Revelation. The Book of Revelation has puzzled interpreters for centuries and was nearly excluded from the canon in the fourth century and was shunned by Protestants during the Reformation. In this course, students will explore the reasons behind

Revelation's disputed status. The class will begin with the text of Revelation itself, and students will learn practices of New Testament interpretation by preparing a section of text for each class meeting. Students will pay particular attention to the literary genre and style of this book and to its social and historical context by exploring the variety of ways the text has been understood. Participants in the course will learn to recognize interpretive choices that a reader of Revelation makes and to analyze how the interpreter's social context may affect the interpretation. A range of scholarly and popular interpretations of Revelation—written, musical, and visual—will be considered. Sessions will be discussion-oriented with brief introductory lectures. [3] Hylen.

3174. Ethics of the New Testament. The ethical teaching found in selected documents of the New Testament (such as the Sermon on the Mount, Luke-Acts, Paul's letters). Comparison of these documents in terms of the types of behavior expected of the believers and of the basis upon which their specific ethical teachings are established. [3] Patte.

3176. Cultural Criticism and the New Testament. An introduction to the paradigm of cultural criticism in biblical studies, with a focus on theoretical orientations, approaches to the text, and interpretations of texts. Previous work in biblical criticism required. [3] Segovia.

3344.01. Contemporary Biblical Hermeneutics: The U.S. Scene. An analysis of the methods and goals of biblical interpretation in the United States since the decline of historical criticism, with special focus on reader response criticism and the relationship between social location and interpretation. [3] Segovia.

3344.02. Ideological Criticism: Socioeconomic and Liberation Studies. Analyzes the juncture of economic studies and biblical criticism in the texts of early Christianity as well as in the interpretations and interpreters of such texts in modernity and postmodernity; the course has a two-fold focus: the trajectory and parameters of hermeneutics of liberation and the questions of political economy and social class in the Roman Empire. [3] Segovia.

3344.03. Ideological Criticism: Postcolonial Studies. Ideological criticism may be seen as a fourth major paradigm in biblical interpretation, with a focus on the analysis of unequal relations of power in society and culture. This seminar will address a particular set of such relations: the analysis of the conceptions of race and ethnicity and the allied notions of nations, diasporas, and minorities. Ideological criticism is profoundly interdisciplinary in character and requires, therefore, attention to a body of work outside biblical studies. [3] Segovia.

3345. Contemporary Biblical Hermeneutics: The Global Scene. An analysis of the methods and goals of contemporary biblical interpretation in Africa, Asia, Latin America, and the West. [3] Segovia.

3347. Acts of the Apostles. Exegesis of selected passages from Acts 1–15 with foci on various methodological perspectives. Greek required. [3] Levine.

3830. New Testament Studies: Ethos and Locos/Methods and Theories. Open to GDR students only. [3] Segovia.

3834. Literary Criticism and the New Testament. The tradition of literary criticism from Plato to the present as a critical background for exploring recent literary studies of the New Testament. Knowledge of Greek required. [3] Segovia.

3836. Seminar: Structural Exegesis of the New Testament. Structural exegesis of various texts of the New Testament using methods derived from semiological literary criticism (Greimas, Barthes) and from structural anthropology (Lévi-Strauss). Prerequisite: Greek. [3] Patte.

3839. Cultural Studies and the New Testament. An introduction to the paradigm of cultural studies in biblical criticism, with a focus on theoretical orientations, approaches to the text, and interpretations of texts. Previous work in biblical criticism required. [3] Segovia.

3841. Seminar in New Testament. [Variable credit]

3843. Hellenistic Culture and Literature. Primary and secondary texts, presenting aspects of the history, literature, and religious traditions of the Hellenistic period (ca. 4th century B.C.E. to 4th century C.E.). Knowledge of Greek required. [3]

3845. Global Interpretations of the New Testament. Comparing interpretations of biblical texts by Christians in Africa, Asia, Latin America, and Oceania—where at present two-thirds of the readers of the Bible are located—with the interpretations of Orthodox Christians in Eastern Europe and the Middle East and by Catholic and Protestant Christians in Western Europe and North America. [3] Segovia.

3960. Special Topics in Religion. [3]

3961. Special Topics in Religion. [3]

3975. Reading Course in New Testament. May be repeated. [1–3]

X. Religion, Psychology, and Culture

2550. Pastoral Theology and Care. This course introduces students to basic theories and methods of pastoral care, especially in the ecclesial context. This course assumes that care is mediated through acts of pastoral leadership, liturgy, preaching, and the forming of congregational life and programming as well as through specific individual conversations. Special attention is paid to the person of the pastor as caregiver and leader of a community of faith and care. [3]

3052. Seminar: Self in Social Context. Pastoral theology and practices of care are aided and directed by operative understandings of the self. What is the self? Is it real? Is it universal? How does it come into being? How does it develop, and how does it relate to the divine? These are fundamental questions in pastoral theology. Responding to the insights of feminists, social theorists, and philosophers, contemporary pastoral theologians have been revising their theological anthropologies to include an understanding of the self that takes more seriously its social dimensions. What does attention to the situated self tell us about effective pastoral care, the meaning of healing/salvation, and the nature of God? In this course we will read social scientific, philosophical, and theological accounts of a self formed within its social, institutional, and cultural contexts. We will also explore the implications of this theological anthropology for a variety of practices. [3] B. McClure.

3053. Seminar: Contemporary Psychotherapy and Pastoral Counseling. Recent trends in psychotherapy. Theories of personality and personality change, as do strategies for psychotherapy. Students will assess critically the implications of these theories for pastoral counseling. Prerequisite: 2550. [3] Vaughn, B. Miller-McLemore.

3054. Seminar: Method and Evaluation. The use of the social sciences in the investigation of religious phenomena. The psychological analysis of religion. Representative studies and empirical investigations are sampled. [3] Gay.

3055. Families: Theory and Practice. Course focusing on practical concerns and theoretical understandings of current family issues and strategic solutions in theology, the human sciences, and ministry. [3] B. Miller-McLemore.

3056. Seminar: Pastoral Method in Ministry . Critical examination of pastoral method in the ministry of care and counseling. Close attention given to the place of the social sciences in pastoral method. Considers issues in the use of quantitative and qualitative research methods. [3]

3057.01. Seminar: Hope and Despair. This seminar from the pastoral theology and counseling discipline explores variable topics; for the spring term, the theme is hope and despair. [3] Vaughn.

3058. Multicultural Pastoral Care and Counseling. Multicultural pastoral care and counseling through a consideration of the biases of traditional western approaches to counseling and the issues for a pluralistic world. [3]

3059. Seminar: Shame and Guilt. Students enrolled in this seminar will examine the dynamics of shame and guilt in social and personal life from theological, psychological, and pastoral perspectives. [3] Flesberg.

3060. Freudian Theories and Religion. An intense reading and discussion of fundamental texts in psychoanalysis and their relationship to Freud's critique of religion. The basic requirements and texts are introductory; more advanced students can use supplementary texts and approaches. [3] Gay.

3061. Post-Freudian Theories and Religion. An examination of the Object Relations school of contemporary psychoanalysis (M. Klein, D. Winnicott, W. R. D. Fairbairn, Otto Kernberg, Heinz Kohut). Focus on both the clinical and the explanatory theories as they relate to the examination of religious experience and similar self states. [3] Gay.

3064. Seminar: Theories of Human Development. This course provides a general introduction to human development across the lifespan and is a survey of developmental processes that influence the growth of the physical, intellectual, socio-emotional and spiritual aspects of the person and the family. It includes a holistic approach to developmental changes that integrates theories, research, and application. Participants are encouraged to formulate a personal philosophy of what constitutes optimum growth and development. Some consideration is also given to practical implications (for example, for child-rearing and educational practices). [3] B. McClure.

3065. Psychology of Ritual and Myth. Examination of religious rituals and myths from both Christian and other traditions. Critical review of major psychological theories of ritual and myth and their relevance to an understanding of myth and ritual as religious phenomena. To be offered alternately with 3752. [3] Gay.

3067. Sexuality: Ethics, Theology, and Pastoral Practice. A critical investigation of selected readings in the general area of sexuality, intimacy, and relationships as they inform pastoral practice. Uses autobiography and case study methods in conversation with theories in social sciences, ethics, and theology. [3] Flesberg.

3069. Theories of Personality. A study of representative theorists within each of the four forces of psychology to clarify alternative understandings of the nature of personality and approaches to the psychological sciences. Attention is given to relationships with pastoral theology and counseling. [3] B. Miller-McLemore.

3070. Gender, Sexuality, and the Family . Addresses such issues as divorce, custody, blended families, reproductive issues, infidelity and adultery, unpaid labor in the household, rape, incest, domestic violence, and coming out. The class will focus on the delivery of pastoral care and counseling related to these issues and will also address the utilization of community resources to facilitate further care. The course's design seeks to equip those who intend to be front-line care providers; an introductory course in pastoral care is a prerequisite unless approval is given by the instructor. [3] Flesberg.

3071. Pastoral Counseling in the Parish. An in-depth exploration of the parish context as it affects pastoral counseling; styles of relationship of pastor and people; images of pastor as healer and spiritual director; pastoral counseling and community; role of the laity in caring and counseling; pastoral diagnosis; and the relationship of counseling to ritual, worship, and other aspects of parish ministry. [3]

3072. Pastoral Theology for Transitions and Crises. Examines various pastoral responses to persons facing transitions (e.g., birth, vocational choice, partnering, marriage, aging, and dying) and crises (e.g., illness, bereavement, and interpersonal discord). Close attention paid to the theological and psychological dimensions of these experiences. Current research in coping and religious coping theory to develop strategies for theological reflection and pastoral action. Prerequisite: 2550. [3] Flesberg.

3073. Seminar: Pastoral Theology: Histories and Horizons. It is important for pastoral and practical theologians to situate themselves historically, theoretically, and theologically in the field. This course will provide an overview of the history of pastoral theology from Augustine to the present, and ask, What is the operative theological anthropology? How is illness/healing understood? What practices were designed to address the "ills"? Who were the detractors of the theories and practices, both internal and external? Where is the field now, and where does it appear to be headed? Answering these questions will help students broaden their understanding of themes and issues in the field and to situate themselves in the conversation. [3] B. McClure.

3074. Pastoral Theology: Issues and Methods. A study of methods and topics in pastoral theology, focusing on the history of the field, the development of its procedures and subject matter, and a variety of contemporary approaches, problems, and revisions. [3] B. Miller-McLemore.

3079. Women, Psychology, and Religion. An exploration of the psychological and religious ideas that support a system of advantage based on gender and sexuality, with particular focus on women's development, self-concept, and altered views of counseling and religious practice. [3] B. Miller-McLemore.

3081. Spirituality and Pastoral Care. An exploration into the history and contemporary literature on spirituality within the pastoral care tradition. Topics include the differentiation between spiritual direction and pastoral care; the history of the cure/care of souls; feminist spirituality, African American spirituality, and spirituality from the margins. [3] B. Miller-McLemore.

3084. Readings in Heinz Kohut and Self-Psychology. Investigates the writings on self-psychology of theorist and analyst Heinz Kohut with attention to the implications of his ideas about the formation and fragmentation of the self for individual health and development, cultural context, psychotherapy, and pastoral care and counseling. Evaluation of the theory in conversation with various critical theological perspectives. [3] B. Miller-McLemore.

3309. Latino/a Religion, Society, and Culture. Students who enroll in this seminar will analyze the rise and the development of Latino/a religion and theology in view of the group's historical context and experience, with attention devoted to various aspects of Latino/a religion and culture. *The course will involve a dimension of service learning in the community; knowledge of Spanish, while ideal, is not required.* [3] Olazagasti-Segovia and Segovia.

3752. The Religious Self According to Jung. The religious core of human existence, as related to the concepts of the archaic unconscious and the birth of the self in C. G. Jung's analytical psychology. Study of the life and thought of Jung as illustrated by his autobiography, *Memories, Dreams, Reflections*. Critical assessment of his theory as a means to understand religious phenomena. [3] Gay.

3755. Critical Issues in Psychotherapy. Examination of key areas of psychotherapy including patient's experience of therapy, unconscious thought processes in therapy, interpretation as intervention, transference and the interpretation of transference. [3] Gay.

3756. Personal and Organizational Trans/Formation. The church and the world are in great need of participants who are clear on their own missions and callings and who can lean into their gifts and passions to address the needs of organizations, issues, and other persons. This course will offer students opportunities for understanding themselves better and how to leverage what they bring for the good of the world—and how to “participate in the life of God” in transformative ways. Students will explore the development of values and vocation, human development, group processes, and organizational change. [3] B. McClure.

3757. Seminar: Methods in Religion and Personality. A study of the relationship of theology and science in general and religion and personality theory specifically. Uses several classic models as illustrative of the ways that persons have attempted to bring these two disciplines and enterprises together. [3] B. Miller-McLemore.

3760. Clinical Seminar. An ongoing case conference required of all Ph.D. students in Religion and Personality. [0–3] Miller-McLemore, Staff.

3960. Special Topics in Religion. [3]

3961. Special Topics in Religion. [3]

3970. Readings in Religion and Personality. [1–3] Staff.

3971. Reading Course in Pastoral Theology. [1–3] Staff.

3972. Death and Dying. Addresses the issues of theology and pastoral practice that pertain to ministering to the dying and the bereaved. Participants will have opportunities to consider and to clarify their theological postures regarding theodicy, eschatology, sin and sickness, prayer, suicide, euthanasia, and hope. The course also will examine how one’s theological commitments translate into authentic acts of care such as accompanying the dying, offering support to the bereaved, and assisting the family in making decisions. [3]

4017. Children and Christian Faith. Explores primary cultural and religious revolutions in perceptions of childhood, classical and contemporary Christian views of children, and the role of families and congregations in promoting the well-being of children within and beyond the church. [3] B. Miller-McLemore.

XI. Theological Studies

Interpretation, Language, and Belief

2505. Religious Autobiography. Considers the genre of autobiography and the roles of memory and belief in constructing narrative; students will read from the classics of Christian, Jewish, and Native American autobiographies, as well as from other religious traditions, to determine how race, class, gender, and sexuality affect the portrayal of religious experiences. [3] D. Sasson.

3192. Theology in the United Methodist Tradition. The history of theology in the United Methodist tradition, beginning with John Wesley and the rise of English Methodism in the eighteenth century. The major doctrinal concerns that have characterized Methodism historically and its position on several social concerns. The English scene, concluding with the death of John Wesley in 1791. The American theological tradition. [3] Meeks.

3309. Gender, Theology, and the Religious Imagination. Explores the influence of gender (as both difference and identity) on Western theological discourse and the human religious imagination. This exploration is guided by the notion that there is much work left to do in unveiling the impact of gender in its broadest sense on where we’ve been, where we want to go, and how we’re going to get there—religiously speaking. Particular emphasis will be placed on naming the influence of gender on theological understandings of self, world, and

god. A second major emphasis will be to explore the ways in which religious experience and community reflect gendered priorities. Questions related to the pursuit of gender equality will be used to frame the course as a whole. [3]

3537. The Holocaust: Representation and Reflection. Explores fundamental questions about the nature of history and representation, the nature of the human and the divine, that the Holocaust raises. Prerequisite: 3524 or its equivalent. [3] Geller.

3960. Special Topics in Religion. [3]

Current Issues in Systematic and Philosophical Theology

2656. Constructive Christian Theology I. Introduction to the discipline of theology with practice in reading texts in the field, formulating critical positions and enhancing theological thinking and writing skills. Emphasis will be on the constructive development and reformulation of the major interconnected themes of Christian theology, considered in relation both to the doctrinal tradition and to the challenges of the contemporary context. Themes for the first semester will include the nature and tasks of theology, scripture and authority, the doctrine of God, creating and the relation of God to the world, and Christology. Prerequisite: 2503, 2511, 2701, and either 2703 or 2704. [3] Meeks.

2657. Constructive Christian Theology II. The expansion of Christianity, the development of doctrine, relationships with the Roman Empire, development of church institutions, and changing modes of Christian life from the second century into the Middle Ages, with emphasis on the periods and themes that are formative of the classical doctrines and institutional patterns. Major purpose of the course is to establish the background for the division of the Western church and the subsequent development of the Roman Catholic and Protestant churches. [3] Thatamanil.

3311. Modern Critics of Religion. An examination of the relationship between the critique of religion and the understanding of modernity. Focus on the writings of Feuerbach, Kierkegaard, Marx, Nietzsche, and Freud. [3] Geller.

3312. Theologies, Traditions, and Difference. Contemporary concerns with the historical marginalization of particular groups in North American society have resulted in much attention to the topic of "difference," whether it be ethnic, religious, racial, class, sexual, gender, or other markers of particularity. This course looks at how three important traditions have framed and responded to these issues—liberal political, Christian theological, and post-modern. Not typically read together, these theories offer modes of ethical and communal thinking and will shape the focus of the course in its investigation of how communities ought to engage difference within and beyond their bounds. Seminar Readings will include Johan Rawls, Kent Greenawalt, Donald Moon, William Connolly, Derrida, A. MacIntyre, John Yoder, John Milbank, and S. Welch, among others. [3]

3313. God, Economy, and Poverty. This course will focus on the ways Christian Scripture, tradition, and contemporary theology relate to poverty. Attention will be given to theology's task of criticizing deformed concepts of God that mask or justify conditions of poverty and theology's constructive task of articulating alternative ways of viewing the poor and eliminating the conditions of poverty. There also will be focus on ecclesial practices of life with the poor in relation to business, legal, and political solutions in the sphere of public policy. Among issues of the culture of our market society that address the exclusion or inclusion of the poor, these will be considered: lending and debt, property rights, comparative advantage, competition, consumerism, health care delivery, education, and the culture of despair. [3] Meeks.

3315. Creation and Ecology. Recent theological treatments of creation in light of ecological crises and scientific-technological developments. Readings include various views of nature, evolution, and biogenetic intervention and differing theological responses. [3] Meeks.

3317. The Doctrine of the Trinity. Classical and modern formulations of the doctrine of the Trinity, with reference to questions concerning divine process, the relation of God and the world, and the problem of belief in God. [3] DeHart.

3318. Economy and Theology. Critical retrieval of biblical and trinitarian understandings of the “economy of God” in relation to contemporary economic theory. Focus on the church’s response to major economic problems related to property/inclusion, work/income, and consumption/sustainability. [3] Meeks.

3319. Ecclesiology. The study of recent theologies of the church with concentration on the nature, sacraments, ministries, and mission of the church in twenty-first century societies. [3] Meeks.

3320. Christology. Contemporary theologies of the life, work, death, resurrection, and presence of Jesus Christ. Focus on ways in which views of salvation, self, society, and nature interact with the memory of Israel’s Jesus. Readings from Jewish, eschatological, feminist, black, and ecological perspectives. [3] Meeks.

3321. Process Theology. Contributions made to Christian theology by the tradition of process thought, and the questions raised for process thought by the character of Christian theology. [3]

3322. Theology of World Religions. The recent interreligious dialogue and its implications for Christian theology. The way in which global religious pluralism affects the nature and task of theology and the relation among major world religions as claims to truth. [3]

3323. Spirit, Community, and Social Theory. Study of the doctrine of the Holy Spirit in contemporary theology in dialogue with recent social theories (Bourdieu, Walzer, McIntyre, Taylor, Milbank). Focus on problems of embodiment, identity, law, language, community formation, gifting, etc. [3] Meeks.

3327. Contemporary Theology. The major movements in Christian thought from the beginnings of dialectical theology to the present. [3] Meeks.

3328. Eschatology and Apocalypse in Modern/Postmodern Theology. The development of eschatological and apocalyptic theology in relation to the modern and postmodern experience of evil, guilt, and death. [3] Meeks.

3330. Theology and Contemporary Continental Philosophy. Addresses the important figures in contemporary continental thought whose contributions are particularly significant in the study of theology; among the philosophers and theorists who will be studied are Jacques Derrida, Michel Foucault, Giorgio Agamben, Emmanuel Levinas, Luce Irigaray, and Julia Kristeva. [3] Armour.

3339. Latin American Theology. A survey of theological production in Latin America, Catholic and Protestant, with a focus on Liberation Theology—origins and development, concerns and parameters, critical reception and present status. [3] Segovia.

3340. Feminist Theology. Introduce students to the classic texts and themes of feminist, womanist, and mujerista theologies as well as to current issues and important texts on the relationships among sexuality, gender, and race, the validity of “women’s experiences” as sources for feminist theological reflection, and feminist critiques and reconstructions of traditional theological loci. [3] Armour.

3342. Feminist Hermeneutics. The revisionary interpretation feminists are currently proposing in such areas as literary theory, anthropology, psychology, ethics, and philosophy and their possible effect on contemporary theology and biblical analysis. [3]

3352. Paul Tillich and the Future of Theology. This course will engage in close readings of Paul Tillich’s three-volume *Systematic Theology* with the following questions in mind: what

is Tillich's role in the future of Christian Theology? In what ways must Tillich's project be modified if it is to be viable for any future constructive Christian theology? How does our knowledge of the world's religious traditions require a rethinking of content and structure of Tillich's system? [3] Thatamanil.

3353. Comparative Theology: South Asia. The purpose for this course is twofold: 1) to introduce students to major South Asian traditions, texts, and thinkers in the Hindu and Buddhist traditions in theological depth; likely thinkers to be discussed include Nagarjuna, Sankara, and Ramanuja; 2) to introduce methods for the emerging field of comparative theology; thinkers to be considered here include Francis X. Clooney, S. J. and Robert C. Neville. [3] Thatamanil.

3355. Hindu-Christian Dialogue. Introduces students to basic texts and motifs of Hindu religious traditions and then brings specific texts, themes, and thinkers into dialogue with Christian theology. Central themes to be considered include samsara, moksha, devotion, karma, liberating knowledge, meditation, nondualism, and varieties of Hindu theism. The course will examine vernacular literatures as well as classical Sanskrit texts. The course will also take up present tensions between Hindus and Christians on conversion, caste and communalism. The course will conclude with readings from contemporary Christian theologians who do theology in conversation with Hinduism. Likely figures may include Raimon Panikkar, Francis X. Clooney, and Sathianathan Clarke (Dalit theology). [3] Thatamanil.

3356. Buddhist and Christian Dialogue. Introduces students to the rich theoretical and contemplative fruit of the continuous dialogue that has been flourishing for several decades between Buddhists and Christians. Following an introduction to Theravada and Mahayana Buddhism through a close reading of selected primary sources, we will read Christian thinkers who engage those primary sources while asking, "What can Christian theologians learn from Buddhism?" Much of the "dialogue" between Buddhists and Christians has transpired in silent meditation. Students will be introduced to practices of Buddhist meditation and Christian contemplative prayer; they will be encouraged to consider what these rich practices teach us about each tradition's experience of the way events are. Conversation with Buddhists inevitably raises the most searching and profound questions for Christians. Is it possible to be religious without reference to an ultimate Divine being? If so (and Buddhists do just this), then what are the implications of such non-theistic "spirituality" for Christian thinking? Are Buddhists and Christians taking different paths to the same destination, or is each religious tradition committed to a good not to be found in the other? Can dialogue between traditions lead to a mutual transformation of Buddhism and Christianity? [3] Thatamanil.

3357. God and the Other in Relational Theology. The theme of otherness has acquired central importance in much recent philosophy and theology. As an ethical theme, philosophers such as Emmanuel Levinas, call us to defer to the absolute dignity and inviolability of the Other. Theologically, the encounter with the face of the Other is said to be site of our encounter with God. But ontologically, there is a fundamental question to be addressed: Is it meaningful to speak of the neighbor as radically Other? Are not self and other co-constituted in and through relationship? If that is true, then in what sense can we speak of deferring to the absolute priority of the Other? Perhaps God is encountered not in the Other but in the "between" where self and other meet and become. In summary, how are we to think together these two profound notions, relatedness and otherness? This course will explore otherness and relationality in philosophy and theology. In philosophy, we will begin by reading Martin Buber, Emmanuel Levinas, and the Buddhist thinker of relationality, Nagarjuna. We shall then consider how these themes have been and might yet be appropriated in contemporary constructive theology. Our conversation partners will include Catherine Keller, Anselm Min, F. LeRon Shults, and John Zizioulas. [3] Thatamanil.

3833. Postcolonialism and Christian Studies. Analysis of relationship between Postcolonial Studies and Theological Studies in the contemporary world. Focus on theological production of non-Western world and of non-Western minorities in the West. [3] Segovia.

3858. Thomas Aquinas. Systematic investigation of Aquinas' major theological and philosophical assertions by considering his conception of the two disciplines and their relationships. All readings will be available in English translations. [3] DeHart.

3908. Seminar in Systematic Theology: Christology. Students in this advanced seminar will explore the contemporary theologies of the life, work, death, resurrection, and presence of Jesus Christ; class sessions will address the ways in which views of salvation, self, society, and nature interact with the memory of Israel's Jesus. The readings for the seminar will include Jewish, eschatological, feminist, black, and ecological perspectives. [3] Meeks.

3909. Theories of Race, Gender, Sexuality, and Disability. Recently many subfields of religious studies, including theology, have taken up theories of race, gender, and sexuality generated by scholars in the humanities and social sciences. This course will cover important texts in the theoretical literature with an eye toward their import for constructive work in theology and other subfields. In addition to critical race theory, gender theory, and queer theory, we also will explore the emerging field of disability theory. [3] Armour.

3923. God in the Western Tradition. The major philosophical and theological texts of the Western tradition from Plato to the twentieth century. The changing history of the interpretation of God from Christian neoplatonism to nineteenth- and twentieth-century challenges of classical approaches. [3] DeHart.

3924. Becoming Divine: Eastern Orthodox Theology and Spirituality. This course will engage Eastern Orthodox Theology and spirituality and ask what resources this tradition has to offer for contemporary constructive Christian theology and spirituality. The contributions of Athanasius, Nyssa, Pseudo-Dionysius, Maximus, and Palamas. This course will also engage contemporary theologians who engage components of the Orthodox tradition like Vladimir Lossky and Jean-Luc Marion. [3] Thatamanil.

3960. Special Topics in Religion. [3]

3983. Reading Course in Systematic Theology. [1–3] Staff.

3984. Reading Course in Philosophical Theology. [1–3] Staff.

3987. Readings in Religion/Gender/Sexuality. [1–3] Staff.

Theology and the Christian Tradition

3208. The Theology of Martin Luther. Students who enroll in this seminar will explore the basic shape of Luther's thought with particular emphasis upon the systematic interconnections of the doctrines of God, Christ, Scripture, the church, and civil society based on their relation to the central themes of justification and faith. [3] DeHart.

3325. Protestant Theology in the Nineteenth Century. Major movements in Protestant thought during the nineteenth century, from Schleiermacher to Troeltsch. [3] DeHart.

3327. Contemporary Theology. The major movements in Christian thought from the beginnings of dialectical theology to the present. [3] Meeks.

3333. Theology of Karl Barth. An introduction to the thought of one of the most important and controversial theologians of the twentieth century. [3] DeHart.

3346. Kierkegaard the Theologian. An advanced exploration of Kierkegaard's philosophy of Christian belief, with particular attention to his analysis of faith, the relation of ethics and

religion, sin and human existence, and his metaphysical and theistic assumptions. Based on close reading and classroom analysis and discussion of selected texts from the pseudonymous authorship. [3] DeHart.

3912. Mystical Literature from Plotinus to John of the Cross. Traces the various inflections of what emerges as a strikingly unified tradition of discourse about the experience of union, *unio mysticus*, across the Middle Ages from Plotinus to John of the Cross. Particular emphasis placed on apophasis, or the failure of language, prior to this experience. [3] Franke.

3960. Special Topics in Religion. [3]

3961. Special Topics in Religion. [3]

3981. Reading Course in Historical Theology. [1–3] Staff.

XII. Theology and Practice

2001. Theology and Practice Colloquy . The two-semester colloquy provides a social and intellectual space for conversation about the goods and purposes of theological education. The colloquy is limited to fellows in the Program in Theology and Practice. It is required of Theology and Practice fellows in their first three years of Ph.D. work. The course is graded Pass/Fail. One credit hour is awarded in the spring semester. [1] Staff.

2002. Theology and Practice Seminar I: Practical Theology and Religion in Global Context. Designed for doctoral students in the Theology and Practice program, the purpose of this two-semester course is to introduce practical theology and to engage in it. The fall semester focuses on the exploration of contemporary literature and methods in practical theology. Participants will also determine a particular problem in religious practice, some form of ministry, or the interaction of ministry and the wider society for more concentrated study in the second semester. [3] Staff.

Social Psychology

✦ THE interdisciplinary program in Social Psychology provides doctoral students with the opportunity to pursue either a major concentration or a minor in social psychology. Students choose a major concentration in social psychology through the graduate program in Psychology, Sociology, or Management (Organization Studies). A minor may be chosen through these programs as well as Community Research and Action or Psychology and Human Development. The program is coordinated by an interdisciplinary faculty committee composed of William P. Smith and Kenneth A. Wallston (*Psychological Science*), Bruce Barry, Jennifer Escalas, and Raymond Friedman (*Management*), and Douglas D. Perkins (*Community Research and Action*).

Students are admitted to and earn the Ph.D. degree in one of the participating disciplines and complete a minimum of five courses related to social psychology offered by the programs and approved by the interdisciplinary committee. In addition, participants enroll in an interdisciplinary seminar in social psychology for at least three semesters. (See program Web site

www.vanderbilt.edu/socialpsych for a current list of electives and the seminar schedule.) Students choosing a major concentration conduct their dissertation research in social psychology.

Prospective students should apply for admission in Psychological Science, Sociology, or Management and indicate on the Graduate School's application their interest in social psychology. Individuals already studying in these disciplines may elect at any time to complete a major or minor concentration in social psychology, and those in Community Research and Action may satisfy a minor concentration by enrolling in the required course sequence.

Core Seminar

PSYCHOLOGY: 361, Interdisciplinary Seminar in Social Psychology. May be repeated.

Sociology

CHAIR Katharine Donato

DIRECTOR OF GRADUATE STUDIES Karen E. Campbell

PROFESSORS EMERITI Ernest Q. Campbell, Jack P. Gibbs, Walter R. Gove,
Richard A. Peterson

PROFESSORS Daniel B. Cornfield, Katharine Donato, Larry W. Isaac, Gary F. Jensen,
Holly J. McCammon, Ronnie Steinberg

ASSOCIATE PROFESSORS George Becker, Tony Brown, Karen E. Campbell, Monica J.
Casper, James J. Lang

ASSISTANT PROFESSORS Laura Carpenter, Michael Ezell, Shaul Kelner, Jennifer Lena,
Richard Lloyd, Richard Pitt, Steven J. Tepper

SENIOR LECTURER Maryaltani Karpos

DEGREES OFFERED: *Master of Arts, Doctor of Philosophy*

✦ THE Sociology program prepares students for research and teaching careers in academic and policy settings. Students are exposed to a wide range of sociological works and research methods. Emphasis is on becoming an independent social researcher and teacher. Students have an opportunity to work closely with faculty members, in part because of a low ratio of graduate students to faculty members (roughly a one-to-one ratio).

The master's program consists of 36 hours of required course work: 301, 302, 310, 311, 312, one methods seminar, two survey seminars, one special topic seminar, and 9 hours of electives. Also, students must write a master's paper by the end of their fifth semester in order to receive a master's degree.

Students must satisfy all of the master's degree requirements in order to receive a Ph.D. In addition, Ph.D. degree course work requirements consist of 323 and 33 hours of electives (up to 20 hours of which may be 399). Students must pass two special area exams, defend a dissertation proposal, complete a dissertation, and defend a dissertation in order to receive a Ph.D. degree.

Students may transfer up to 30 credit hours of eligible, graduate course work performed at another institution, subject to the approval of the director of graduate studies, the department chair, and the Graduate School.

204. Self, Society, and Social Change. Problems and prospects for individual participation in social change; volunteering, community service, and philanthropy; role of individuals and voluntary associations in social change. [3] (Not currently offered)

220. Population and Society . The mutual influence of demographic factors and social structure. Trends in fertility, mortality, population growth, distribution, migration, and composition. Population policy and national development. [3] (Not currently offered)

224. Women and Law. History of laws subordinating women and efforts by feminists to achieve substantive and procedural equity. American historical examples augmented by comparative research. Examines employment law , laws making rape and domestic violence illegal, and tax law. FALL. [3] Steinberg.

230. The Family. Study of the relationship of family structure to social organization. Comparative and historical approaches to the family . Recent changes in the American family . Courtship, marriage, marital adjustment, parenthood, and family dissolution in relation to contemporary American society. [3] (Not currently offered)

231. Criminology. The nature, distribution, causes, and control of crime with emphases on contemporary American society and a broad range of types of crime. FALL, SPRING. [3] Becker.

232. Delinquency and Juvenile Justice. The nature, distribution, causes and control of juvenile delinquency and the operation of the juvenile justice system in contemporary American society. SPRING. [3] Jense.

233. Deviant Behavior and Social Control. The social causes of, and societal reactions to, several types of deviant behavior (e.g., juvenile delinquency , crime, sex deviance, mental illness). Examines the probable consequences of suggested solutions to reduce different types of deviant behavior. SPRING. [3] Noble.

234. Prison Life. Prison life from the perspective of prisoners, officials, and the society in which they operate. FALL, SPRING. [3] Karpos, Noble.

235. Contemporary American Society. Shifts in the political, economic, and social structure of the United States; changes in technology, demography, and social mores. FALL. [3] Lloyd.

236. Class, Status, and Power . Analysis of the competition for jobs, advancement, and income. The influence of social background, education, politics, race, sex, changes in the national economy, and other factors will be considered. Theoretical and empirical analysis focusing on the United States. [3] (Not currently offered)

237. Society and Medicine. Cultural and social factors in the perception, definition, diagnosis, treatment, and distribution of disease. Doctor -patient relations; role of nurses and other health professions. Social consequences of hospitals, medical technology , medical specialization, and health insurance. FALL, SPRING. [3] Talley, Brown.

238. Social Problems of American Medicine. Problems of medical care in the United States in terms of their historical development and of their sociological concepts and principles. [3] (Not currently offered)

240. Law and Society. Examines the relationship between the legal system and other institutions with illustrations drawn from both American and other societies. The actual operation of the legal system including lawyers, courts, and police is described. [3] (Not currently offered)

241. Art in Society. A description of the process of creating, displaying, merchandising, and evaluating art. Analysis of artist circles, production companies, training centers, patrons, critics, dealers, audiences, and government influences in the contemporary American scene as well as in other times and places. [3] (Not currently offered)

242. The Urban Community. Social organization of the urban community. Historical and contemporary patterns in the structure and growth of the city. World urbanism and social change. [3] (Not currently offered)

243. Revolutions in the Modern World. From the French Revolution to the breakdown of communism and the rise of radical Islamic movements. Diffusion and transformation of challenging strategies and ideologies. Developmental paths opened or altered on a global scale. Links to domestic terror and international terrorism. [3] (Not currently offered)

244. Politics, State, and Society. Topics include the political effects of bureaucratization, social conditions necessary for democracy, the political implications of technological changes, structural differentiation and conflict among elites. Attention is given to formal models of political processes, such as those of conflict and coalition formation. [3] (Not currently offered)

245. Music in Society. Production, use, and evaluation of music as social processes and shared practices. How music expresses status and identity. Making music together and making musicians. The impact of changing technology on music. Pop, rock, classical, jazz, country, hip hop, salsa, blues, alternative, and folk music. [3] (Not currently offered)

246. Sociology of Religion. Theories of the nature, function, and structure of religion. Religion in America, including fundamentalism, the Black Church, and cults. How religion changes and is changed by secular society. [3] (Not currently offered)

247. Human Behavior in Organizations. Organizations are treated as resources in the production and distribution of goods and services. Case analyses from the economy are reviewed to diagnose "organizational pathologies" and to understand reciprocal impacts among organizational structures, leaders, and citizens. FALL. [3] Spetalnick.

248. Popular Culture Dynamics. Examination of theories and research that link culture and society. Consideration of the mass media arts with particular emphasis on popular music. Focus on creators, industry, and audiences. [3] (Not currently offered)

249. American Social Movements. The effect of key social movements on American society. Comparison of the organization and success of movements such as the American Revolution, Southern Secession, Populism, Woman's Suffrage, and Civil Rights. FALL, SPRING. [3] Muse.

250. Gender in Society. Theoretical approaches to gender relations with a focus on the contemporary U.S. Evolution of gender stereotypes, gender socialization over the life course, gender in social interactions, institutional sources of gender inequality, and intersections of gender with race, social class, and sexual identity. Topics include work, school, families, health, and intimate relationships. FALL, SPRING. [3] Talley.

251. Women and Public Policy in America. A study of public policies as they affect women in contemporary American society. Issues considered include participation of women in the labor force; effects of employment patterns on the family; birth control, abortion, and health care policies; child care; participation of women in political processes; divorce, child support, and custody; affirmative action policies; present governmental remedies and proposed alternatives. [3] (Not currently offered)

254. Schools and Society: The Sociology of Education. How schools affect individuals and relate to institutions: the government, the economy, social classes, and families. How social attributes, including race and class, affect academic achievement. Controversies such as desegregation and intelligence testing. [3] (Not currently offered)

255. Racial and Ethnic Minorities in the United States. Status of blacks, Asians, Hispanics, and other minorities. Migration, identity and association, and strategies to improve group status and reduce intergroup tensions. Comparisons to other countries. SPRING. [3] Pitt.

257. Gender, Sexuality, and the Body. The body is a physical marker of gender and sexuality. Biological reproduction is saturated with social meanings—shaping ideas about masculinity, femininity, the gender division of labor, and heterosexuality. In this course, we will look at the body as reflexive project and as the site of historical and ideological significance. We address race, ethnicity, physical abilities, and class in explaining variations in cultural ideals. SPRING. [3] Carpenter.

258. The South in American Culture. The changing relationship between the South and the rest of the country and its effects on understandings and definitions of the South, and changes in southern social structures and patterns, race relations, and economic and political institutions. [3] (Not currently offered)

260. The Individual and Society. How individuals, as social beings, are created by society, and how society is in turn created and sustained by individuals. The social self, stigmas, deviance and identity, social structure and personality, small group processes, collective behavior. [3] (Not currently offered)

261. Work and Family in American Life. The changing relationship between work and family from the Colonial era to the present. Role of the U.S. corporation, specialization of the family, sex roles, social mobility. [3] (Not currently offered)

262. Interpersonal and Intergroup Relations. An examination of social psychological literature related to intergroup and interpersonal conflict and its resolution, with special attention to problems of relations between black and white in contemporary society. [3] (Not currently offered)

263. Religion, Science, and the Paranormal. Critical study of paranormalism as a belief system at the fringes of science and religion. [3] (Not currently offered)

264. Social Dynamics of Mental Health. Definition and classification of mental health and mental illness. Emphasis on social factors affecting mental health. Different ways of responding to persons in poor mental health and consequences of particular responses. FALL, SPRING. [3] Muse.

265. Psychological Anthropology. (Also listed as Anthropology 265) How personality and culture affect each other. Socialization and the life cycle, the definition of sex roles, individual psychology and group aggression, religion and group personality, and the nature of mental illness and normalcy in non-Western societies. [3] (Not currently offered)

270. Human Ecology and Society. Demographic growth, social organization, technology, and the global environment. Sustainable agriculture, ecological degradation. Urban waste and recycling. Community-based approaches to development in Asia and Latin America. FALL. [3] Lang.

272. Gender Identities, Interactions, and Relationships. Gender identities for men and influence interactions in friendships, intimate relations, families, education, and other institutions. Changes and continuities in gender roles within the United States and ways in which race, class, and sexual orientation intersect processes of gender relations. [3] (Not currently offered)

277. Contemporary Latin America. Current history and long-term trends; regional trade. Development strategies and social inequalities. Hispanic Americans, immigration, and the U.S. border; the war on drugs. Race, music, and popular culture. [3] (Not currently offered)

278. Comparative Asian Development. Emphasis on modern India, China, and Japan. Current history and long-term trends. Religious, social, and artistic traditions. Models of modernization; dilemmas of development; challenges of globalization. [3] (Not currently offered)

281. Development for a Small Planet. Community-based approaches to public health, food production, and education. Appropriate technology; creating sustainable life styles; dilemmas of big development. Examples from Asia, Africa, and the Americas. [3] (Not currently offered)

294. Seminars in Selected Topics. Topics of special interest, as announced in the *Schedule of Courses*. May be repeated for credit once if there is no duplication of topic. F ALL. [3] Steinberg.

301. Classical Theory. Theoretical perspectives and theorists in the early history of sociology, focusing primarily on Durkheim, Marx, and Weber. [3] (Not currently offered)

302. Contemporary Theory. Modern developments including neo-Marxist, functionalist, structuralist, conflict, interactionist, exchange/rational choice, and feminist theories. [3] (Not currently offered)

310. Sociological Inquiry. Introduction to research methods, including theory construction, sociological reasoning, study design, and specific research techniques. Normally limited to graduate students in the department. FALL. [3] Donato.

311. Multivariate Analysis I. Basic concepts in probability and statistical analysis. Multivariate analysis of sociological data, with special attention to regression analysis. The use of computers. Prerequisite: enrollment in graduate program in sociology or permission of the instructor. FALL. [3] Ezell.

312. Multivariate Analysis II. The general linear model in analyzing sociological data, including analysis of variance, regression, path analysis, and parametric techniques for contingency-table analysis. Practice in the use of computers. Prerequisite: 311 or an equivalent statistics course approved by the instructor. SPRING. [3] Ezell.

313. Quantitative Methods Workshop. Analysis of large data sets from the social sciences or of data brought to the course by students. Scaling and measurement; nonparametric analysis of contingency tables; and advanced topics in regression and path analysis. Prerequisite: 312 or an equivalent statistics course approved by the instructor. [3] (Not currently offered)

323. Teaching Workshop. For students wanting to improve their teaching skills. Students visit the classrooms of outstanding teachers on campus and discuss their approach to teaching; deliver lectures in the presence of critics; examine their own lectures on videotape; discuss methods of evaluation; read outstanding books on college teaching; and survey teaching materials produced by the American Sociological Association. Normally limited to graduate students in the department. Graded P/F only. SPRING. [3] Campbell.

Courses numbered 331–347 are taught as “survey seminars.” Course assignments aim at giving students breadth, and, to that end, a wide range of readings are covered in a seminar format. One of these seminars is usually offered each semester.

331. Survey Seminar on Inequalities and Movements. Relationship between multiple forms of social inequality, such as class, race, and gender inequality, and related social movements. SPRING. [3] Isaac.

333. Survey Seminar on Cultural Sociology. The creation of culture, including values, norms, beliefs, symbols, and life-styles. The reproduction of society through culture; institutions that purposefully preserve, produce, and transmit aspects of culture. [3] (Not currently offered)

335. Survey Seminar on Deviant Behavior and Social Control. Major works on crime, juvenile delinquency, and forms of extralegal deviance. Social control in connection with counteraction of deviance, sociology of law, and manipulation of human behavior. [3] (Not currently offered)

339. Survey Seminar on Political Sociology. Classical and modern theories about the nature and distribution of power in society and other human groups. The social bases and implications of major political institutions, the state in particular; collective behavior and social movements; and political order and change. [3] (Not currently offered)

341. Survey Seminar on Population Studies and Human Ecology. Population processes, elements of social organization, and their interaction. Major theories and research pertaining to fertility, mortality, migration, urbanization, urban structure, technology, and the division of labor. [3] (Not currently offered)

343. Survey Seminar on Social Psychology. The interaction of social structure and personality. Socialization, social perception, small groups, exchange theory, and symbolic interactionism. [3] (Not currently offered)

345. Survey Seminar on Social Stratification. Major theories and lines of research pertaining to the origin, nature, and functioning of systems of social inequality. [3] (Not currently offered)

347. Survey Seminar on Sociology of Science and Knowledge. How ideas and systems of thought are related to the social structure and culture of societies. Institutionalization of scientific and intellectual activity, scientific and intellectual communities or organizations, and social influences on the directions of research by scientists and academicians. [3] (Not currently offered)

Courses numbered 361–371 treat “special topics” in sociology. Title and focus of each seminar depends on the interests of students and the faculty. In all, students are expected to engage in research, design research, or undertake some other kind of creative work, and report the product in a semester paper. One usually offered each semester.

361. Special-Topic Seminars on Social Phenomena at the Macro Level. Each focuses on some aspect of social structure, social organization, culture, international relations, global systems, spatial organization, or the social division of labor. Cities, communities, urban areas, metropolitan areas, regions, countries, or status categories are the principal units of comparison. FALL. [3] Lloyd.

363. Special-Topic Seminars on Institutions and Organizations. Each focuses on some type of institution—economic, educational, familial, medical, political, or religious—or some type of organization, including business firms and voluntary associations. [3] (Not currently offered)

367. Special-Topic Seminars on Norms, Power, and Related Normative Phenomena. Each focuses on a particular type of deviance, the sociology of law, social control, or political sociology. [3] (Not currently offered)

368. Special-Topic Seminars on Social Processes and Social Change. Each focuses on collective behavior, social movements, innovation and diffusion, societal development, cultural evolution, revolutions, migration, mortality, fertility, or mobility. FALL. [3] Brown.

371. Special-Topic Seminars on Theory and Methodology. Each focuses on a particular theorist, a particular theoretical perspective, the methodology of theory construction, or particular kinds of research methods and statistical techniques. FALL, SPRING. [3] Carpenter, Donato.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

390a–390b. Directed Studies. Students work independently on topics of special interest not covered in depth in course offerings. Work in a tutorial relationship with an individual faculty member or in a student seminar, subject to faculty approval, should several students share a common interest. Prerequisite: consent of the instructor. FALL, SPRING. [Variable credit: 1–3 each semester] Staff.

395a–395b. Research Practicum. Research with the guidance of individual faculty members on problems of mutual interest. [3–3] Staff.

399. Ph.D. Dissertation Research.

3995. Half-time Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

Spanish and Portuguese

CHAIR Cathy L. Jrade

ACTING CHAIR Victoria A. Burrus (Spring)

DIRECTOR OF GRADUATE STUDIES Christina Karageorgou

PROFESSORS EMERITI J. Richard Andrews, John L. Bingham, John Crispin,
Russell G. Hamilton, C. Enrique Pupo-Walker, Francisco Ruiz-Ramón

PROFESSORS Earl E. Fitz, Edward Friedman, Cathy L. Jrade, William Luis, René Prieto,
Philip D. Rasico

ASSOCIATE PROFESSORS M. Fräncille Bergquist, Susan Berk-Seligson, Victoria A.
Burrus, Carlos A. Jáuregui, Emanuelle K. F. Oliveira, Benigno Trigo, Andrés Zamora

ASSISTANT PROFESSORS Jason Borge, Christina Karageorgou

SENIOR LECTURERS Frances Alpren, Tatiana Botero, Lorraine Catanzaro, Sarah Delassus,
Chalene Helmuth, Clint Hendrix, Mario Higa, Alicia Lorenzo, Paul Miller, Patrick Murphy,
Elena Olazagasti-Segovia, Carolina Palacios, Raquel Rincón, Waldir Sepúlveda,
Cynthia M. Wasick

DEGREES OFFERED:

SPANISH. *Master of Arts, Doctor of Philosophy*

SPANISH. With specialization in Inter-American Literature. *Doctor of Philosophy*

SPANISH-PORTUGUESE. *Doctor of Philosophy*

PORTUGUESE. *Master of Arts*

✦ THE M.A. programs in Spanish and in Portuguese each require 30 hours of course work. A reading knowledge of another foreign language is also required. (Credit for basic language courses taken do not count toward the degree. For Portuguese M.A. students, the required language is Spanish. For Spanish M.A. students, the recommended language is Portuguese. Students with a special academic interest in another language

should request in writing approval from the director of graduate studies before enrolling in any language other than Portuguese.) A 45-hour double M.A. program is also available, in which a 30-hour M.A. in either Spanish or Portuguese is complemented with 15 additional hours of course work in the other field for the conferment of the second M.A. (No additional foreign language is required.)

The Ph.D. program in Spanish requires 63 hours of course work, which includes the 30 hours of the M.A. in Spanish and 9 hours for a minor, which may be Portuguese, a certificate program in Latin American Studies, an interdisciplinary minor in philosophy and literature, or another approved program of courses from one or more departments. Candidates must demonstrate either a reading knowledge of an additional foreign language beyond the one required for the M.A. (which will normally have been Portuguese) or they may continue in the study of Portuguese (or another approved language) to an advanced level.

The combined Ph.D. in Spanish and Portuguese requires 66 hours of course work, which includes the 45 hours of the double M.A. described above and at least 9 additional hours in each of the two areas. No minor is necessary. Near-native proficiency in both Spanish and Portuguese is required of all students enrolled in the combined program. There is no additional language requirement.

The Ph.D. in Spanish with a specialization in Inter-American Literature offers doctoral students unique preparation to become teachers and scholars of Inter-American language and literature. Core to this track within the Department of Spanish and Portuguese is the development of both comparative linguistics and comparative literary studies. This track requires a minimum of 72 hours of formal course work in the following areas: Spanish (at least 30 hours), Portuguese (at least 21 hours), and 21 hours in one of a number of related fields such as English (American literature), French (Canadian and Caribbean), and Latin American Studies (cultural anthropology). It also requires that students maintain a cumulative grade point average of *B+* or better to remain in good standing. The program is designed to allow students to satisfy the requirements for the Ph.D. within six years. The contact person for this area of specialization is Professor Earl Fitz at earl.e.fitz@vanderbilt.edu.

Additional information about these degrees can be found at <http://sitemason.vanderbilt.edu/spanport>.

Spanish

101G. Spanish for Reading. Survey of grammar and vocabulary, with extensive reading. Available to graduate students for "No Credit" only. [0]

214. Dialectology. Formation, general characteristics, distinctive features, and geographical extension of the principal dialectal regions of Spain and Spanish America. Both historical and modern dialects are considered. Emphasis on nonstandard dialectal varieties of Spanish. FALL. [3] Rasico.

- 216. Phonology.** Analysis of the production, nature, and systematic function of the sounds of the Spanish language, as well as of problems frequently experienced by non-native speakers. Both standard and dialect features of Spanish are examined. FALL. [3] Rasico.
- 217. Contrastive Analysis of Spanish and English.** A comparison of the phonological, morphological, and syntactical structures of Spanish and English to demonstrate the similarities and differences between the linguistic systems of these two languages. FALL. [3] Bergquist.
- 218. Morphology and Syntax.** An introduction to the principles of modern Spanish morphology (word formation) and syntax (phrase structure and usage) through an analysis of the native speaker's organization of reality and use of language to reflect and to express that organization. SPRING. [3] Rasico.
- 219. History of the Spanish Language.** Origins and evolution of the Spanish (Castilian) language. Emphasis on the phonological and morphological development of Spanish within historical and cultural contexts of the Iberian Peninsula. SPRING. [3]
- 220. The Languages of Spain.** Origins, development, and the contemporary sociolinguistic situation of the principal languages and dialects of Spain, including Castilian, Catalan, Galician, and Basque. SPRING. [3] Rasico.
- 230. Development of Lyric Poetry.** Popular and traditional forms; the sonnet and other Renaissance and Baroque classical forms. Romanticism. [3] Staff. (Not currently offered)
- 231. The Origins of Spanish Literature.** From its beginnings to the Renaissance; the creation of a social order and a cultural tradition. Close study of three literary landmarks—*Poema del Cid*, *Libro de Buen Amor*, *La Celestina*—and other prose and poetry selections. SPRING. [3] Burrus.
- 232. Literature of the Spanish Golden Age.** Representative works from early modern Spain, including poetry, prose, and drama of the Renaissance and Baroque periods. SPRING. [3]
- 233. Modern Spanish Literature.** The eighteenth and nineteenth centuries: essays and Neoclassic literature, Romanticism, Realism, and Naturalism. Representative works and authors from all genres. FALL. [3]
- 234. Contemporary Spanish Literature.** Representative authors and works from the Generation of 1898 to the present. SPRING. [3] Staff.
- 235. Spanish American Literature.** The development of all forms from colonial times to World War I. The different patterns of interaction of native American, African, and European cultural traditions. The unity and diversity of Spanish American literature. FALL. [3] Jáuregui, Trigo.
- 236. Contemporary Literature of Spanish America.** All literary forms from World War I to the present. Emphasis on the works of Neruda, Borges, Paz, García Márquez, and others. FALL. [3] Jade, Jáuregui, Prieto, Trigo.
- 237. Contemporary Lyric Poetry.** From Modernism to the present in Spain and Spanish America. FALL. [3] Karageorgou.
- 239. Development of the Novel.** From the seventeenth century through Realism and Naturalism in Spain and Spanish America. SPRING. [3] Zamora.
- 240. The Contemporary Novel.** New forms in the twentieth-century novel in Spain and Spanish America. [3] Staff. (Not currently offered)
- 244. Afro-Hispanic Literature.** From nineteenth-century slave narrative to modern writers such as Miguel Barbet, Alejo Carpentier, and Quince Duncan. SPRING. [3] Luis.

- 246. *Don Quixote*.** Directed reading and intensive study of the novel. FALL. [3] Friedman.
- 251. Development of Drama.** Spanish theatrical works from 1600 to 1900, including the Golden age *comedia*, neoclassicism, romanticism, and early realism in drama. [3] Friedman.
- 256. Love and Honor in Medieval and Golden Age Literature.** The evolution of the key themes of love and honor in works from various genres of medieval and Golden Age Spanish literature with special attention to sociohistorical context. [3] Burrus.
- 260. Development of the Short Story.** From early manifestations in Spain through its current forms in Spain and Spanish America. FALL. [3] Friedman, Prieto.
- 272. Love in the Latin American Novel.** Conceptions of love in Latin American novels beginning in the nineteenth century. The effect of history, race, and morals on the shaping of affective response. FALL. [3] Prieto.
- 276. Going Native in Latin American Literature and Film.** Intersections among literature, cinema, anthropology, and cultural theory, through selected movies and texts from different moments of Latin American cultural history. Ethnographic, historical, and literary narrations and films in which the encounter with the native “savage” causes the destabilization of identity for the “civilized” conqueror, missionary, captive, ethnographer, or traveler. [3] Jáuregui. (Not currently offered)
- 281. The Theory and Practice of Drama.** Critical works and plays from different periods. Introduction to the principles of dramaturgy. [3] Friedman.
- 289. Independent Study.** Designed primarily for majors. Projects are arranged with individual professors and must be approved by the director of undergraduate studies, before the close of registration. FALL, SPRING. [Variable credit: 1–3 each semester, not to exceed 12 over a four-semester period] Staff.
- 293. Contemporary Latin American Prose Fiction in English Translation.** (Also listed as Portuguese 293) Major themes and techniques. No credit for graduate students in Spanish or Portuguese. [3] Fitz, Jrade, Trigo. (Not currently offered)
- 294. Special Topics in Hispanic Literature.** [May be repeated for credit if there is no duplication of topic] FALL, SPRING. [3] Staff.
- 295. Special Topics in Spanish Language and Linguistics.** Topics as announced in the *Schedule of Courses*. FALL, SPRING. [3] Staff.
- 296. Special Topics in Hispanic Culture.** May be repeated for credit if there is no duplication of topic. FALL, SPRING. [3] Staff.
- 301. Literary Analysis and Theory.** (Also listed as Portuguese 301) Methods of literary analysis for the teaching of literature. The systematic application of contemporary theories—structuralist and poststructuralist—in the analysis of poetry and narrative. FALL. [3] Zamora, Friedman.
- 302. Ibero-Romance Philology.** (Also listed as Portuguese 302) Study of the evolution of the languages and dialects of the Iberian Peninsula. Analysis of selected linguistic developments and readings from medieval texts. SPRING. [3] Rasico.
- 310. Foreign Language Learning and Teaching.** (Also listed as Portuguese 310) Principles and practices of teaching a second language, with concentration on recent interactive and communicative models of foreign language instruction. Goals of the course are 1) to introduce principles of Second Language Acquisition and learning, 2) to critically read relevant literature in the area(s), and 3) to develop FL instructor’s awareness through reflective and critical thinking. Classroom observations, journal writing, development of materials, and a

small action-research project are expected. Required of all entering teaching assistants. FALL. [3] Alpen.

314. Introduction to Latin American Colonial Studies. (Also listed as Portuguese 314) Provides a panoramic introduction to the canonical works of the colonial period from “discovery” to “independence,” as well as an overview of the theoretical debates in colonial studies within the Latin American context. Topics include the construction and reshaping of *identities* and *otherness* through various stages of Latin American cultural history, the emergence of what has been called the American consciousness during the “New World Baroque,” and the discourses of “independence” and early nation building. [3] Jáuregui, Fitz.

330. Survey of Medieval Spanish Literature. Introduction to major works of pre-modern Spanish literature through the fifteenth century. [3] Burrus.

331. Seminar: Studies in Medieval Literature. Topics as announced in the *Schedule of Courses*. [3] Burrus. (Not currently offered)

332. Love in Late Medieval Spanish Literature. Examination of the different conceptions and discourses of love in Spain during the fourteenth and fifteenth centuries. [3] Burrus. (Not currently offered)

333. Seminar: Modernismo. The major literary movement of the end of the nineteenth century and beginning of the twentieth century in the Spanish-speaking world. Major authors, their context, and the fundamental ideological and literary shifts evident in their works. [3] Jade.

334. Ordering and Disrupting Fictions in Latin America. Fictions of the mid nineteenth and early twentieth centuries. The racialized and sexualized nature of these imagined communities and their uncanny tendency to disassemble themselves. [3] Trigo.

335. The Spanish American Novel of the Boom Period. An examination of the Boom novel, from the 1960s: *La muerte de Artemio Cruz*, *Rayuela*, *La casa verde* or *Conversación en la Catedral*, *Tres tristes tigres*, and *Cien años de soledad*. [3] Luis.

336. Self-Writing in Latin America. Theory and practice of self-writing; memoir, testimony, autobiography in Latin America. The connection between the body, language, and memory in a subject of both national and individual dimensions. SPRING. [3] Trigo.

337. The Melancholy Novel in Latin America. Construction of a melancholy subject built on the loss of a linguistic, sexual, and racial identity. The works of mourning and remembering of an abject maternal body. Texts by Latin American women writers and Latinas. [3] Trigo. (Not currently offered)

338. Seminar: Studies in Colonial Literature. (Also listed as Portuguese 338) [3] Fitz, Jáuregui. (Not currently offered)

340. Seminar: Hispanic American Essay. (Also listed as Portuguese 340) FALL. [3] Jáuregui.

341. Spanish American and Brazilian Literature I. (Also listed as Portuguese 341) Spanish American and Brazilian literature from the conquests to the end of the nineteenth century. Authors may include: Sor Juana, Matos, Alencar, Assis, and Carrasquilla. Prerequisite: 205. FALL. [3] Fitz.

342. Spanish American and Brazilian Literature II. (Also listed as Portuguese 342) Spanish American and Brazilian literature from twentieth century and to the present. Texts may include: *Os sertões*, *La guerra del fin del mundo*, *Ficciones*, *Perto do coração selvagem*, and *Água viva*. Prerequisite: 205. SPRING. [3] Fitz.

343. Seminar: Studies in Golden Age Drama. The *comedia nueva* in cultural and critical contexts. FALL. [3] Friedman.

344. Seminar: The Baroque. Readings in Spanish baroque literature and culture, including works by Góngora, Quevedo, Cervantes, María de Zayas, Calderón, and Gracián. [3] Friedman.

345. Seminar: Early Modern Spanish Narrative. Readings in Spanish prose fiction from 1550 to 1700, including the picaresque tradition and works by Cervantes, María de Zayas, and other writers. FALL. [3] Friedman.

351. Comparative Methodology. (Also listed as Portuguese 351) Comparative literature as an academic discipline; scholarly and theoretical distinctions; methodologies, applications, relationship to national literature units and humanities programs. SPRING. [3] Fitz.

352. Seminar: Issues in Hispanic Cinema. Possible topics include: feminine reflections in contemporary Spanish cinema; Hispanic variations on the cinematic Bildungsroman; traveling films; delivering the nation (Spain 1975–2005). [3] Zamora, Borge.

353. The Literature of Indianismo and Indigenismo. The evolution of *Indianismo* and *Indigenismo* from the mid-nineteenth century to the present, and native Americans in works of literature. [3] Prieto.

354. The Politics of Identity in Latino U.S. Literature. The writings of Latinas/Latinos from the four largest groups: Chicanos, Cuban Americans, Puerto Rican Americans, and Dominican Americans. Redefinition of borders, cultures, and languages. [3] Luis. (Not currently offered)

361. Seminar: Studies in Eighteenth- and Nineteenth-Century Spanish Literature. A broad survey of specific topics such as: textual civil wars; literary constructions of the nation; reconstruction of the narrative genre (1700–1900); eccentricities of Spanish Enlightenment and/or Spanish Romanticism; theatrical spectacles. SPRING. [3] Zamora.

362. Seminar: The Realist Novel of the Nineteenth-Century Spanish. A multifaceted approach to the Spanish Realist novel with attention to the sociopolitical context, contemporary cultural discourses and practices; European literary and artistic currents of the day, and theoretical formulations on the genre. [3] Zamora.

363. Seminar: Modern Spanish Poetry and Poetics. Key moments of Spanish lyric poetry during the nineteenth and twentieth centuries. Theory and praxis, Romanticism, Avant-Garde, and Post-Modernism. [3] Karageorgou.

369. Master's Thesis Research. [0]

372. Seminar: Studies in Twentieth-Century Spanish Literature. Topics as announced in the *Schedule of Courses*. [3] (Not currently offered)

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

387. Seminar: Contemporary Spanish American Novel. [3] Luis, Jrade, Prieto. (Not currently offered)

388. Special Topics in Spanish Literature. Topics as announced in the *Schedule of Courses*. SPRING. [3] Friedman, Karageorgou, Zamora.

389. Special Topics in Spanish American Literature. Topics as announced in the *Schedule of Courses*. For list of previous topics, please see departmental Web page. FALL, SPRING. [3] Jrade, Luis, Prieto, Trigo.

396. Special Studies in Spanish Linguistics. FALL, SPRING. [Variable credit: 1–6] Staff.

397. Special Studies in Spanish Literature. FALL. [Variable credit: 1–6] Staff.

398. Special Studies in Spanish American Literature. FALL, SPRING. [Variable credit: 1–6] Staff.

399. Ph.D. Dissertation Research.

3995. Half-time Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

Portuguese

200. Intermediate Portuguese. Intermediate or intensive language course. Follow-up of Portuguese 102 or intensive course for students with some previous preparation. Composition, conversation, grammar review. Cultural components, including films, art, music, and literature from the Luso-Brazilian world. FALL, SPRING. [3] Oliveira.

201. Portuguese Composition. Techniques of expository writing. Focus on vocabulary, grammar, and rhetoric. Prerequisite: 200. No credit for graduate students in Spanish and Portuguese. SPRING. [3] Staff.

202. Portuguese Conversation. Development of speaking skills with emphasis on pronunciation, grammar, and vocabulary. Prerequisite: 200. No credit for graduate students in Spanish and Portuguese. FALL. [3] Staff.

203. Brazilian Pop Culture. Development of written and oral communication skills through the study of Brazilian popular culture. Movies, music, television, and magazines. No credit for graduate students in Spanish and Portuguese. Prerequisite: 200. FALL. [3] Oliveira.

205. Introduction to Luso-Brazilian Literature. Critical readings and methods of literary analysis. Selections include masterpieces from Portugal and Brazil and cover all genres in several periods. Emphasis on improving conversational and writing skills. Prerequisite: 200. SPRING. [3] Oliveira.

225. Brazilian Culture. The values and attitudes that shape Brazil and Brazilian national identity. History, race relations, literature, music, cinema, and ecology. Taught in Portuguese. SPRING. [3] Oliveira.

232. Introduction to Brazilian Literature. Main literary trends, principal writers and works of Brazilian literature, from colonial beginnings through the nineteenth century. Study of the works of Gregório de Matos, Gonçalves Dias, Alencar, Machado de Assis and Euclides da Cunha. FALL. [3] Fitz.

233. Modern Brazilian Literature. The development of Brazilian literature from the *Semana de Arte Moderna* to the present. Emphasis on the Modernist and Neo-Modernist movements. SPRING. [3] Fitz.

289. Independent Study. Content varies according to the needs of the individual student. Primarily to cover material not otherwise available to the student in the regular curriculum. FALL, SPRING. [Variable credit: 1–3 hours, not to exceed 12 over a four-semester period]

291. Brazilian Civilization through English Language Material. The cultural heritage of Brazil from its earliest days to the contemporary period. Issues of national identity, race relations, and Brazil's emergence as a major force in the Americas and beyond. Taught in English. No credit for minors or graduate students in Spanish and Portuguese. FALL. [3] Oliveira.

293. Contemporary Latin American Prose Fiction in English Translation. (Also listed as Spanish 293) Major themes and techniques. No credit for graduate students in Spanish or Portuguese. [3] Fitz, Jrade. (Not currently offered)

294. Special Topics in Portuguese Language, Literature, or Civilization. Topics announced in the *Schedule of Courses*. [3] Fitz, Oliveira.

301. Literary Analysis and Theory. (Also listed as Spanish 301) Methods of literary analysis for the teaching of literature. The systematic application of contemporary theories—structuralist and poststructuralist—in the analysis of poetry and narrative. FALL. [3] Zamora, Friedman.

302. Ibero-Romance Philology. (Also listed as Spanish 302) Study of the evolution of the languages and dialects of the Iberian Peninsula. Analysis of selected linguistic developments and readings from medieval texts. SPRING. [3] Rasico.

310. Foreign Language Learning and Teaching. (Also listed as Spanish 310) Principles and practices of teaching a second language, with concentration on recent interactive and communicative models of foreign language instruction. Goals of the course are 1) to introduce principles of Second Language Acquisition and learning, 2) to critically read relevant literature in the area(s), and 3) to develop FL instructor's awareness through reflective and critical thinking. Classroom observations, journal writing, development of materials, and a small action-research project are expected. Required of all entering teaching assistants. FALL. [3] Alpren.

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338. Seminar: Studies in Colonial Literature. (Also listed as Spanish 338) [3] Fitz, Jáuregui. (Not currently offered)

340. Seminar: Hispanic American Essay. (Also listed as Spanish 340) FALL. [3] Jáuregui.

341. Spanish American and Brazilian Literature I. (Also listed as Spanish 341) Spanish American and Brazilian literature from the conquests to the end of the nineteenth century. Authors may include: Sor Juana, Matos, Alencar, Assis, and Carrasquilla. Prerequisite: 205. FALL. [3] Fitz.

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351. Comparative Methodology. (Also listed as Spanish 351) Comparative literature as an academic discipline: definition, scholarly and theoretical distinctions, methodologies, applications, relationship to comparative literature. SPRING. [3] Fitz.

379. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

385. Seminar: Studies in Contemporary Literature of the Portuguese-Speaking World (Portugal, Brazil, Lusophone Africa). Variable topics to be announced in the *Schedule of Courses*. May be repeated with change of topic. FALL. [3] Oliveira, Fitz.

397. Special Studies in Portuguese Literature. FALL, SPRING. [Variable credit: 1–6] Staff.

398. Special Studies in Brazilian Literature. SPRING. [Variable credit: 1–6] Staff.

399. Ph.D. Dissertation Research.

3995. Half-time Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

Special Education

CHAIR Craig H. Kennedy

DIRECTOR OF GRADUATE STUDIES Mark Wolery

PROFESSORS Anne L. Corn, Stephen N. Elliott, Donna Y. Ford, Douglas Fuchs,
Lynn S. Fuchs, Stephen E. Graham, Karen R. Harris, Robert Hodapp, Carolyn Hughes,
Ann P. Kaiser, Craig H. Kennedy, Daniel Reschly, Mark Wolery, Paul J. Yoder

RESEARCH PROFESSOR Ted S. Hasselbring

ASSOCIATE PROFESSORS Donald L. Compton, Joseph J. Cunningham, Mary Louise
Hemmeter, Kathleen L. Lane, Joseph H. Wehby

ASSOCIATE PROFESSOR OF THE PRACTICE Kimberly Paulsen

ASSISTANT PROFESSOR Kathleen L. Lane

ASSISTANT PROFESSOR OF THE PRACTICE Andrea M. Capizzi, Alexandra Da Fonte,
Ruth A. Wolery

DEGREE OFFERED: *Doctor of Philosophy*

☞ THE program of study is based in the multidisciplinary body of knowledge relevant to the understanding, education, and treatment of persons with disabilities. The Ph.D. degree is composed of three major elements of course work: core studies in special education, including 10 hours of pro-seminar in special education; at least 13 formal course hours in research methods; and a 15-hour minor or related area of study. The program of study will be planned individually with the major professor and approved by the student's qualifying committee. In addition, the program requires demonstration of competence in research methods and dissemination and in college teaching/supervision.

3000. Education and Psychology of Exceptional Learners. An overview of people who are labeled "exceptional" and the implications for education related to them. The disabilities that people have and services, systems, and concepts associated with them. Legal, sociological, educational, political, general system theory perspectives and psychological perspectives. State and federal law relating to education from infancy to adulthood will be related to intervention, ethics, and issues. Trends and issues related to the areas of exceptionality and relate these to previous trends, issues, and attitudes. FALL. [3] Staff.

3010. Proseminar I. Advanced review of research and scientific principles, methods, and the status of research and other professional developments in special education. Required for post-master's degree students in special education. FALL. [3] Kaiser.

3011. Proseminar II: Contrasting Research Methodologies in Special Education Research. An overview of the frameworks and major designs within three alternative research methodologies within Special Education: single-subject research, group design, and qualitative methods. Prerequisite: 3010. SPRING. [3] L. Fuchs.

3012. Research Design in Special Education. In-depth analysis of group research methodology within Special Education. Design features and statistical methods are reviewed; research is critiqued; and sample studies are designed. Prerequisite: 3010, 3011. FALL. [3] L. Fuchs.

3013. Introduction to Single-Subject Research Methodology. Initial course in the use of single subject research methodology within Special Education. Overview of behavioral measurement, single subject research designs, and methods of data analysis. Critical analysis of research articles. Development of a single subject research proposal is required. Prerequisite: 3210. SPRING. [3] M. Wolery.

3014. Advanced Procedures in Single-Subject Research Methodology. Use of research procedures to investigate problems in the education of persons with disabilities. Advanced procedures in single subject research methodology, including design strategies and experimental control, are emphasized. Design and implementation of a research study is required. Prerequisite: 3014, 3210. FALL. [3] Wehby.

3015. Implementing Research in Special Education. Provides structure and support for students implementing studies in Special Education. Design and implementation issues in research are reviewed with peers and faculty participants to help students resolve problems and design better studies. Prerequisite: 3010, 3011, 3012, 3014. SPRING. [1] Staff.

3016. Teacher Education Research. Designed for doctoral students interested in preservice teacher education research. It focuses on two of the most important domains in the teacher education field, namely teacher learning and multicultural teacher education research. SPRING. [3] Staff.

3017. Experimental Analysis of Behavior . Overview of basic behavioral processes. Presents information relating to human and nonhuman learning with a focus on the experimental analysis of behavior. Topics covered include environmental feedback mechanisms, schedules of reinforcement, establishing operations, multioperant performances, discriminative stimulus control, stimulus equivalence, rule-governed behavior, behavioral pharmacology, and remembering/forgetting. The course also focuses on research methodologies and the critical analysis of research. Students apply their skills using computer-based simulations of laboratory experiments. [3] Kennedy.

3018. Observational Methods. This doctoral-level course addresses what is known about quantitative, systematic observation of behavior to measure behavior that may or may not be used to infer status on psychological constructs. The content emphasis is on providing students with the rationale for selecting among the many options at all stages of observational measurement. Among the topics covered are (a) classical measurement theory and Generalizability theory as they relate to observational measurement, (b) principles for selecting measurement procedures, selecting behavior sampling methods, designing coding systems, selecting appropriate metrics (including nonsequential and sequential variables), (c) sequential analysis of behavior, (d) the tension between ecological validity, representativeness, and construct validity, (e) interobserver reliability issues, and (f) other issues related to the direct observation of behavior. [3] Yoder.

3030. Advanced Issues in Family Intervention. Issues and practices related to families with children who have special needs. Emphasis on taking a family systems perspective and a family centered approach to intervention. Provides strategies for effective communication for

the purpose of information sharing and collaborative planning with families. Topics include definition and history of the family, family and professional relationships, professional ethics, models of working with families, service coordination, family assessment and the IFSP, promoting family participation in the IEP, and Public Laws, including I.D.E.A. FALL. [3] Staff.

3040. Administration and Supervision in Special Education. Principles, theories, and methods of administration that emphasize managerial functions. Prepares students to assume leadership roles in special education and organizations providing services for people with disabling conditions. Prerequisite: 3000 or consent of instructor. [3] (Not currently offered)

3050. Augmentative and Alternative Communication. This course is designed to provide an overview of the field of augmentative and alternative communication (ACC) for use with young children and school-age children with severe disabilities. Specifically, the course will provide an overview of theories that are important to the understanding of appropriate uses of ACC systems; and, the course will provide information about the efficacy of these systems with students with severe disabilities. Topics will include: guidelines for selecting, implementing, using, and monitoring the use of ACC systems. [3] Da Fonte.

3060. Cultural Diversity in American Education. Focuses on cultural diversity and the ways in which it has been defined and treated in the American educational system. An interdisciplinary perspective informs the course, with particular attention to history, sociology, psychology, anthropology, and educational literatures. FALL. [3] Ford.

3070. Special Education Law. Survey of current law relating to special education of infants, toddlers, children, and youth and adults. Emphasis is on major federal statutes and regulations, particularly the Individuals with Disabilities Education Act and its regulations. Related laws include "Section 504," grants and contracts law, related state laws, leading cases (e.g., AIDS, extended school year, LRE, testing, private residential placement), IEPs, and Family Service Plans. Proper APA citation and writing about laws and cases. [3] (Not currently offered)

3080. High Poverty Youth: Improving Outcomes. Youth from high poverty backgrounds often are placed at-risk for a host of unfavorable outcomes including academic failure, school dropout, drug abuse, unemployment, and incarceration. In this class, we will be working with schools and community agencies in Nashville to improve outcomes for youth living in high poverty neighborhoods. We will have class meetings twice weekly as well as ongoing field-based experiences. Field work will include mentoring, tutoring, or providing job readiness training to youth in neighborhood community centers or in students' high schools. [3]

3120. Field Work in Special Education Teaching. Observation, participation, and classroom teaching for graduate and professional students majoring or minoring in any of the areas of exceptionality. May be repeated for credit. Prerequisite: consent of instructor. FALL, SPRING. [1–6] Staff.

3130. Advanced Field Work in Special Education. Practicum for graduate and professional students majoring or minoring in any area of exceptionality, with opportunity for supervised participation in community special education programs. May be repeated for credit. Prerequisite: consent of instructor. FALL, SPRING. [1–6] Staff.

3140. Extended Student Teaching for Graduate Students. Graduate student teaching, observation, participation, and full-day classroom teaching. Designed for graduate students with no previous undergraduate student teaching experience. Prerequisite: 3120 and consent of department. FALL, SPRING. [6] Staff.

3210. Management Procedures for Academic and Social Behavior. Application of behavioral principles in educational settings. Definition and measurement of behavior, reinforcement strategies, systematic program development, basic formats for classroom instruction, and techniques for monitoring student progress. Procedures for increasing academic and socially appropriate behavior through simulations and practice exercises. Review of research methodologies and the critical analysis of research literature in the area of applied behavior analysis are required. Students apply their skills in classroom settings. Corequisite: 1 hour of 312 or 313. FALL. [3] Lane.

3230. Research Methods in Special Education. Students will learn the purposes, procedures, and processes of conducting research on educational and psychological issues of exceptional children and educational programs. Includes the study of terminology and research methods (both quantitative and qualitative) and "hands-on" application of methods in small-scale pilot studies within the classroom. Some study of statistical procedures is included, but the practical methods and simple computer analyses are emphasized over formulas and mathematical calculations. [3] D. Fuchs.

3250. Proseminar in Mental Retardation. (Also listed as Psychology and Human Development 325P) Variable topics. May be repeated with change in topic. FALL, SPRING. [2] Staff.

3300. Advanced Programming for Students with Severe Disabilities. Provides information on the nature and needs of individuals with severe/profound disabilities and the roles of federal, state, and local agencies in providing services to this population. Emphasis on strategies for the acquisition and generalized use of age-appropriate functional skills in natural community-based settings. Methods for developing, implementing, and evaluating individualized programming across specialized curricular areas such as communicative, cognitive, functional academic, motor, domestic living/self-help, recreation/leisure, vocational, and general community living skills. Current research evidence to support effective practices is stressed. FALL. [3] Hughes.

3310. Transition for Persons with Disabilities. Theory and practice of transition from school to community and employment living for young adults with disabilities. Legislative history and practical applications of skills such as job development and job placement. Prerequisite: 3300. [3] Hughes.

3320. Advanced Transition for Persons with Disabilities. Extends and deepens the course content of 3310. Greater emphasis on development of programs and interagency collaboration and development of community-based transition. Prerequisite: 3300, 3310, or consent of instructor. [3] Hughes.

3330. Advanced Procedures for Students with Multiple Disabilities. The causes, treatment, education, and management of students with multiple disabling conditions, including neurological impairments resulting in physical disabilities, sensory impairments, and the combination of these. Emphasis on environmental adaptations and direct training needed to maximize independence as determined through systematic ecological inventories. Physical and medical management. Competencies in research-based programming. SPRING. [3] Staff.

3340. Instructional Principles and Procedures for Students with Severe Disabilities. Characteristics and models of effective instruction, particularly for students with severe disabilities. Behavioral, ecological, and developmental learning theories and implications for instruction. Methods for defining current level of functioning, designing interventions, and monitoring learner progress. Review of fundamental special education procedures including IEP development, task and concept analysis, effective teaching strategies, and functional curriculum programming. Current research evidence to support effective practices. [3] (Not currently offered)

3360. Advanced Procedures for Community and Employment Integration. Graduate-level course in advanced procedures in community and employment integration of persons with disabilities. Strategies that may be applied on four levels in order to facilitate integration: (a) individual, (b) school or workplace, (c) community, and (d) systems-wide. Students implement interventions in school, work, or community settings. SPRING. [3] Hughes.

3400. Foundations of Early Childhood Special Education. Provides the historical, legal, and theoretical foundations of early intervention/early childhood special education for infants, toddlers, and preschoolers with disabilities. Includes recommended practices related to assessment and instruction for early childhood classes. Discusses typical and atypical development, assessment to identify goals and outcomes, and strategies for promoting development. [3]

3410. Recommended Practices in Early Childhood Special Education. Provides information on typical and atypical development of infants, toddlers, and preschoolers with disabilities. Includes in-depth treatment of recommended practices in assessment, instruction, application of practices in natural and inclusive environments, and working with other professionals in service sites. [3]

3420. Recommended Practices in Early Elementary Grades for Children with Disabilities. Provides information on typical and atypical development of early elementary children with disabilities. Includes discussions of the general education curriculum (literacy, mathematics, social studies, and science) and recommended practices in adapting that curriculum for children with disabilities. [3]

3510. Educational Procedures for Visually Impaired Learners. Introduction to the literature, history, principles, programs, practices, and problems in the field. Administrative, curricular, and methodological adaptations for various educational programs. The education of individuals with visual impairments and other accompanying disabilities. SPRING. [3] Com.

3540. Communication Skills for Visually Impaired Learners. Emphasis on methods of teaching communication skills and the preparation of materials for the visually impaired. Open only to teachers who have a working knowledge of braille. Consent of instructor required. SPRING. [3] Staff.

3550. Orientation and Mobility Skills for Teachers of Visually Impaired. Lectures, discussions, and simulated activities in teaching orientation, mobility concepts, and skills to visually impaired individuals. Offered by a mobility specialist. FALL. [3] Staff.

3580. Advanced Procedures for Visually Impaired Learners. Topics related to assessment, social skills development, transitions, career development, consumerism, and other unique areas of the core curriculum for visually impaired learners. FALL. [3] Staff.

3590. Advanced Orientation and Mobility Skills for Teachers of Visually Impaired: Practicum. Advanced course equips orientation and mobility specialists with methods, techniques, and approaches using the long cane and other mobility devices essential in the development of safe and efficient travel skills of persons with visual impairments. Demonstration, simulation, and practicum experiences in various settings. Prerequisite: 2550 or consent of instructor. FALL. [3] Staff.

3600. Speech and Language for Exceptional Learners. An overview of normal language development, psycholinguistic theory, and research. Emphasis on specific intervention procedures useful for teachers of children and youth with severe/profound or mild/moderate disabling conditions. SPRING. [3] Staff.

3690. Master's Thesis Research.

3700. Applications of Technology in the Classroom. The use of computer-based instruction and management systems to facilitate classroom instruction. Review of the history of the development of computers; the use of technology with persons with disabilities; review and analysis of microcomputer and video technology hardware and software; overview of instructional and managerial computer applications. No previous computer experience required. SPRING. [3] Staff.

3710. Advanced Applications of Technology in the Classroom. Models and techniques of instruction for integrating computers and technology into special education classroom curricula. The development, implementation, and advanced instructional and managerial applications of technology when used with disabled individuals. Prerequisite: 3700 or equivalent. [3] (Not currently offered)

3720. Seminar: Microcomputer Technology in Special Education. An in-depth look at the use of existing microcomputer technology as it relates to research on teaching and learning in special education. Seminar participants review extant research on the use of microcomputer technology with special-needs populations and propose new applications of existing and developing technology. Each class member is required to participate in developing a section of a publishable manuscript on the topic "what we know about the effectiveness of special education technology," and will be expected to demonstrate basic competencies in the use of the microcomputer for research and professional dissemination activities. [3] (Not currently offered)

3790. Non-candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0–12]

3800. Advanced Trends and Issues in Learning Disabilities. Advanced study of current trends, research, and issues in mild/moderate disabilities with specific emphasis on learning disabilities. Historical perspectives and theoretical models; empirical research related to definitions, identification procedures, conceptualizations, educational strategies, and service delivery options for individuals with learning disabilities. FALL. [3] D. Fuchs.

3810. Advanced Trends and Issues for Students with Behavior Disorders. Historical overview and analysis of theoretical issues regarding etiology and treatment of severe behavior disorders. Definitions, historical development, contributing factors, and major classifications of behavior disorders. Research methods used in treating disordered behavior. Ability to analyze, synthesize, and apply research methods related to prevention and management strategies with children and adolescents is required. FALL. [3] Wehby.

3820. Advanced Issues and Procedures in the Assessment of Students with Mild/Moderate Disabilities. The diagnosis and evaluation of students with mild/moderate disabilities using a variety of developmentally appropriate curriculum-based assessments, criterion-referenced, and norm-referenced tests in the academic and vocational subject areas. Emphasis on the interpretation of information from assessments into Individualized Education Program annual goals and objectives and instructional programming strategies. Specific consideration is given to reporting assessment information to parents, teachers, and other support personnel to determine appropriate placement levels within the continuum of services. Practical application is required. FALL. [3] Staff.

3825. Educational Testing, Assessment, and Accountability. In-depth analysis of testing, assessment, and accountability applied to general and special education. Analysis of applied issues such as standards-based reform, annual yearly progress, response to intervention, and program effectiveness. FALL. [3]

3830. Advanced Instructional Procedures for Students with Mild/Moderate Disabilities.

This methodological course consists of two principal components. The first applies instructional design, delivery, and assessment procedures taught in 383 to mathematics content. Intensive instruction in the theory of direct, explicit mathematics instruction. The second component reviews technological advances and validated learning, test-taking, study, and self-monitoring strategies for students with mild/moderate disabilities. SPRING. [3] Paulsen.

3840. Instructional Principles and Procedures in Reading and Writing for Students with Disabilities.

Presents empirically validated instructional procedures to address the reading and writing deficits of students with disabilities. Focuses on explicit teaching procedures, direct instruction, and instructional design principles that apply to reading and writing. Proficiency in the development of assessment profiles, instructional lessons, monitoring of progress through curriculum-based measures and data-based decision making is required. [3]

3845. Advanced Principles and Procedures in Reading and Writing for Students with Disabilities.

This course focuses on the etiology and treatment of developmental reading and writing problems in children. Methods for designing effective instruction/interventions, principles that apply for defining current level of functioning, and monitoring learner progress are emphasized. SPRING. [3]

3850. Consultation Strategies for Teachers of Students with Mild/Moderate Disabilities.

The history, theory, and research associated with models of school consultation with an emphasis on behavioral consultation. The use of behavioral consultation to help teachers better accommodate individuals with social and academic problems in their classrooms. Interdisciplinary consultation strategies involving parents, medical, vocational, career, and social work professionals. Prerequisite: 3800 or 3860. [3] (Not currently offered)

3860. Advanced Procedures in Classroom Management and Social Skills Instruction for Students with Mild/Moderate Disabilities.

Current teaching practices in the field, with emphasis on examination of the research bases of effective teaching with students with behavior problems. Procedures for serving learners with behavior problems who are served by consultant, resource, and self-contained teachers. Students are expected to synthesize and analyze research on effective teaching and management practices and to apply the knowledge to classroom situations for students with behavior problems. SPRING. [3] Staff.

3870. Accommodating Diversity in the Classroom. Explores the importance and difficulty of teaching heterogeneously grouped students in mainstream classrooms and offers specific instructional strategies for doing so effectively. Focuses explicitly and exclusively on methods to help classroom teachers instruct and manage the behavior of a broad range of students—students with and without disabilities at multiple points along the achievement continuum. SPRING. [3] D. Fuchs.

3880. Teaching Special Education in Secondary Schools.

This course consists of two components. The first component focuses on an overview of special education in secondary schools. Emphasis will be placed on specific secondary models, characteristics of high school students with disabilities, and dropout prevention. The second component focuses on empirically-based test-taking, study, self-monitoring, and self-advocacy strategies. Accommodations for students with disabilities within content areas are also emphasized. FALL. [2] Hughes.

3930. Seminar in Special Education. Special topic areas directly related to students' objectives. FALL, SPRING. [Variable credit: 1–4] Staff.

3931. Seminar: Behavioral Research in Education of the Visually Impaired. Analysis and synthesis of research, theory, and the literature in education and related psychological and social factors for blind and visually impaired persons. FALL, SPRING. [1–3] Corn.

3937. Seminar: Issues and Trends in Early Childhood Special Education. Topical seminar in research issues relevant to early childhood special education. SPRING. [Variable credit: 1–3] Kaiser.

3950. Internship in Special Education. Supervised on-site experience in a professional role as teacher, counselor, research associate, administrative aide, or other member of professional teams. Consent of major professor required. SPRING. [Variable credit: 1–12] Staff.

3960. Readings and Research in Special Education. Individual programs. May be repeated. Consent of instructor required. FALL, SPRING. [Variable credit: 1–3] Staff.

3990. Ph.D. Dissertation Research.

3995. Half-time Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

Teaching and Learning

See Learning, Teaching, and Diversity

Women's and Gender Studies

DIRECTOR Monica J. Casper

✦ VANDERBILT University's program in Women's and Gender Studies offers an interdisciplinary graduate certificate program in gender studies. The certificate program provides graduate students across campus with access to interdisciplinary scholarship in the robust field of gender studies; supplies them with a valuable professional credential; enhances pedagogical skills; and strengthens their ability to compete for jobs as well as national fellowships and postdoctoral awards.

Any student enrolled in a graduate program at Vanderbilt University is eligible to apply for the certificate program in gender studies. Acceptance to the program requires a minimum GPA of 3.3, satisfactory performance of *B+* or better in Women's and Gender Studies 301, and the approval of both the student's adviser and the director of the Women's and Gender Studies Program.

Please contact the Women's and Gender Studies Program for more information at womens-studies@vanderbilt.edu or phone (615) 343-7808.

Requirements for Graduate Certificate in Gender Studies

1. Women's and Gender Studies 301.

2. Women's and Gender Studies 302.

3. Three additional graduate-level courses on women, gender, and/or sexuality, appropriate to the student's program of study. Courses must be approved for credit and include at least one course outside the student's area. One course may be satisfied through an independent study with a faculty member affiliated with the Women's and Gender Studies Program, with the approval of the director of Women's and Gender Studies.

4. A paper submitted to the Women's and Gender Studies steering committee for evaluation. The paper must demonstrate the application of a gender studies methodology to research, teaching, or fieldwork.

301. Gender and Sexuality: Feminist Approaches. Interdisciplinary introduction to the major debates, theoretical terms, and research methods in feminist, gender, sexuality, and queer studies. SPRING. [3] Oliver

302. Gender and Pedagogy. Feminist theories of teaching and learning; gender and diversity in the classroom; critical pedagogy. SPRING. [1] Dicker.

389. Independent Study. Work in a tutorial relationship with an individual faculty member or in a student seminar, subject to faculty approval, should several students share a common interest. FALL, SPRING. [Variable credit: 1–3 each semester] Staff.

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University Honors Held by Members of the Vanderbilt Faculty

The Harvie Branscomb Distinguished Professor Award, begun in 1964 and awarded annually for a period of one year, recognizes the distinguished accomplishment of a faculty member in furthering the aims of the university. The award is made by the Chancellor on recommendation of the Consultative Committee of the Faculty Senate.

- 1964 AMOS CHRISTIE, Professor of Pediatrics
- 1965 WILLARD B. JEWELL, Professor of Geology
- 1966 AVERY LEISERSON, Professor of Political Science
- 1967 NICHOLAS GEORGESCU-ROEGEN, Distinguished Professor of Economics
- 1968 CHARLES RAWLINSON PARK, Professor of Physiology
- 1969 JAMES PHILIP HYATT, Professor of Old Testament
- 1970 CHARLES F. DELZELL, Professor of History
- 1971 DEWEY W. GRANTHAM, Professor of History
- 1972 ELLIOT V. NEWMAN, Joe and Morris Werthan Professor of Experimental Medicine
- 1973 WILLIAM H. NICHOLLS, Professor of Economics
- 1974 BJARNI JÓNSSON, Distinguished Professor of Mathematics
- 1975 D. STANLEY TARBELL, Distinguished Professor of Chemistry
- 1976 JOHN W. WADE, Distinguished Professor of Law
- 1977 WALTER HARRELSON, Distinguished Professor of Old Testament
- 1978 SIDNEY P. COLOWICK, American Cancer Society–Charles Hayden Foundation
Professor of Microbiology
- 1979 GRANT W. LIDDLE, Professor of Medicine
- 1980 RENDIGS T. FELS, Professor of Economics
- 1981 DOUGLAS E. LEACH, Professor of History
- 1982 OSCAR TOUSTER, Professor of Molecular Biology
- 1983 JOSEPH H. HAMILTON, Landon C. Garland Distinguished Professor of Physics
- 1984 MILDRED R. STAHLMAN, Professor of Pediatrics
- 1985 HANS H. STRUPP, Distinguished Professor of Psychology
- 1986 WILLIAM C. HAVARD, JR., Professor of Political Science
- 1987 ALFRED A. BAUMEISTER, Professor of Psychology and Special Education
- 1988 LEON W. CUNNINGHAM, Professor of Biochemistry
- 1989 SALLIE MCFAGUE, E. Rhodes and Leona B. Carpenter Professor of Theology
- 1990 DAVID T. KARZON, Professor of Pediatrics
- 1991 LAURENCE D. LERNER, Edwin Mims Professor of English
- 1992 CAROLYN M. EVERTSON, Professor of Education
- 1993 FRANK CHYTIL, Professor of Biochemistry; General Foods Distinguished Professor
of Nutrition; Assistant Professor of Medicine
- 1994 FRANK L. PARKER, Distinguished Professor of Environmental and Water
Resources Engineering; Professor of Management of Technology
- 1995 MELVIN D. JOESTEN, Professor of Chemistry; Professor of Education
- 1996 ROBERT D. COLLINS, Professor of Pathology
- 1997 PAUL K. CONKIN, Distinguished Professor of History
- 1998 JOHN A. OATES, Thomas F. Frist Professor of Medicine
- 1999 TRAVIS I. THOMPSON, Professor of Psychology, Peabody College; Professor of
Psychology, College of Arts and Science; Professor of Special Education; Professor of
Psychiatry
- 2000 LAWRENCE J. MARNETT, Mary Geddes Stahlman Chair in Cancer Research;
Professor of Biochemistry; Professor of Chemistry

- 2001 ANN P. KAISER, Professor of Special Education; Professor of Psychology, Peabody College; Director, Research Program on Communication, Cognitive, and Emotional Development, John F. Kennedy Center
- 2002 THOMAS R. HARRIS, Professor of Biomedical Engineering and Chair of the Department; Professor of Chemical Engineering; Professor of Medicine
- 2003 JOHN A. PHILLIPS III, David T. Karzon Professor of Pediatrics; Professor of Biochemistry; Professor of Medicine; Investigator, John F. Kennedy Center for Research on Human Development
- 2004 ROBERT S. DITTUS, Joe and Morris Werthan Professor of Investigative Medicine; Professor of Medicine; Director, Division of General Internal Medicine
- 2005 HAROLD L. MOSES, Hortense B. Ingram Professor of Molecular Oncology; Professor of Cancer Biology; Professor of Pathology; Professor of Medicine; Director, Emeritus, Vanderbilt-Ingram Cancer Center
- 2006 ELAINE SANDERS-BUSH, Professor of Pharmacology; Professor of Psychiatry; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Director, Vanderbilt Brain Institute
- 2007 CECELIA TICHI, William R. Kenan Jr. Professor of English
- 2008 DANIEL B. CORNFIELD, Professor of Sociology

The Alexander Heard Distinguished Service Professor Award was established in 1982 to honor Chancellor Alexander Heard at the time of his retirement. The title is conferred annually, for a one-year period, upon a faculty member in recognition of distinctive contributions to the understanding of contemporary society.

- 1983 DAVID J. WILSON, Professor of Chemistry
- 1984 DAVID RABIN, Professor of Medicine
- 1985 ERWIN C. HARGROVE, Professor of Political Science; Professor of Education
- 1986 ALFRED A. BAUMEISTER, Professor of Psychology, Peabody College
- 1987 WALTER HARRELSON, Distinguished Professor of Old Testament
- 1988 FRANK L. PARKER, Professor of Environmental and Water Resources Engineering; Professor of Management of Technology
- 1989 W. ANDERSON SPICKARD, JR., Professor of Medicine
- 1990 FRANK A. SLOAN, Centennial Professor of Economics
- 1991 LISTON O. MILLS, Oberlin Alumni Professor of Pastoral Theology and Counseling
- 1992 RICHARD A. PRIDE, Associate Professor of Political Science
- 1993 H. CARL HAYWOOD, Professor of Psychology, Peabody College; Professor of Neurology
- 1994 THOMAS A. MAHONEY, Frances Hampton Currey Professor of Organization Studies
- 1995 KARL B. SCHNELLE, JR., Professor of Chemical Engineering; Professor of Environmental Engineering
- 1996 SUSAN FORD WILTSHIRE, Professor of Classics
- 1997 KENNETH A. DODGE, Professor of Psychology; Professor of Psychiatry
- 1998 PAUL K. CONKIN, Distinguished Professor of History
- 1999 JONATHAN I. CHARNEY, Professor of Law
- 2000 HUGH DAVIS GRAHAM, Holland N. McTyeire Professor of History; Professor of Political Science
- 2001 JOHN J. SIEGFRIED, Professor of Economics
- 2002 DAVID J. ERNST, Professor of Physics
- 2003 VIRGINIA L. SHEPHERD, Professor of Pathology; Professor of Biochemistry; Professor of Medicine
- 2004 ELLEN B. GOLDRING, Professor of Educational Policy and Leadership

- 2005 KATHRYN M. EDWARDS, Professor of Pediatrics; Director, Division of Pediatric Clinical Research
- 2006 JAMES W. GUTHRIE, Professor of Public Policy and Education; Director, Peabody Center for Education Policy; Chair, Department of Leadership, Policy, and Organizations
- 2007 STEVEN D. HOLLON, Professor of Psychology, College of Arts and Science; Professor of Psychology, Peabody College; Associate Professor of Psychiatry; Investigator, Vanderbilt Kennedy Center for Research on Human Development
- 2008 DALE C. FARRAN, Professor of Education; Professor of Psychology, Peabody College; Member, Vanderbilt Kennedy Center for Research on Human Development

The Earl Sutherland Prize for Achievement in Research was initiated in 1976. It is awarded annually to a member of the Vanderbilt faculty whose achievements in research, scholarship, or creative expression have had significant critical reception and are recognized nationally or internationally. The recipient is chosen by the Chancellor on recommendation of the University Research Council.

- 1976 NICHOLAS GEORGESCU-ROEGEN, Distinguished Professor of Economics
- 1977 STANLEY COHEN, Distinguished Professor of Biochemistry; American Cancer Society Research Professor of Biochemistry
- 1978 CLAUDE PICHOS, Distinguished Professor of French
- 1979 GRANT W. LIDDLE, Professor of Medicine
- 1980 JOHN W. WADE, Distinguished Professor of Law
- 1981 SIDNEY FLEISCHER, Professor of Molecular Biology
- 1982 BJARNI JÓNSSON, Distinguished Professor of Mathematics
- 1983 DONALD A. DAVIE, Andrew W. Mellon Professor of Humanities and Professor of English
- 1984 CHARLES RAWLINSON PARK, Professor of Physiology
- 1985 JON H. KAAS, Professor of Psychology
- 1986 LUBOMIR HNILICA, Professor of Biochemistry
- 1987 HANS H. STRUPP, Distinguished Professor of Psychology
- 1988 JOSEPH H. HAMILTON, Landon C. Garland Distinguished Professor of Physics
- 1989 PAUL K. CONKIN, Distinguished Professor of History
- 1990 TADASHI INAGAMI, Professor of Biochemistry
- 1991 EDWARD FARLEY, Drucilla Moore Buffington Professor of Theology
- 1992 JAMES F. BLUMSTEIN, Professor of Law
- 1993 THOMAS M. HARRIS, Centennial Professor of Chemistry
- 1994 JOHN H. EXTON, Professor of Molecular Physiology and Biophysics
- 1995 GISELA MOSIG, Professor of Molecular Biology
- 1996 HANS R. STOLL, Anne Marie and Thomas B. Walker Jr. Professor of Finance
- 1997 JOHN D. BRANSFORD, Centennial Professor of Psychology
- 1998 ALICE C. HARRIS, Professor of Linguistics and Chair of the Department of Germanic and Slavic Languages; Professor of Anthropology
- 1999 TRAVIS I. THOMPSON, Professor of Psychology, Peabody College; Professor of Psychology, College of Arts and Science; Professor of Special Education; Professor of Psychiatry
- 2000 RANDOLPH BLAKE, Centennial Professor of Psychology, College of Arts and Science; Investigator and Senior Fellow, John F. Kennedy Center

- 2001 F. PETER GUENGERICH, Professor of Biochemistry; Director, Center in Molecular Toxicology
- 2002 DAVID M. HERCULES, Centennial Professor of Chemistry
- 2003 LEONARD BICKMAN, Professor of Psychology, Peabody College; Associate Dean for Research, Peabody College; Professor of Psychiatry; Director, Mental Health Policy Center, Institute for Public Policy Studies; Member, John F. Kennedy Center for Research on Human Development
- 2004 HERBERT Y. MELTZER, Bixler/Johnson/Mays Professor of Psychiatry; Professor of Pharmacology; Director, Division of Psychopharmacology
- 2005 LYNN S. FUCHS, Professor of Special Education; Nicholas Hobbs Chair in Special Education and Human Development; Investigator, Vanderbilt Kennedy Center for Research on Human Development
- DOUGLAS FUCHS, Professor of Special Education; Nicholas Hobbs Chair in Special Education and Human Development; Investigator, Vanderbilt Kennedy Center for Research on Human Development
- 2006 L. JACKSON ROBERTS II, Professor of Pharmacology; Professor of Medicine; Investigator, Center for Molecular Neuroscience
- 2007 DAVID ROBERTSON, Elton Yates Professor of Autonomic Disorders; Professor of Medicine; Professor of Pharmacology; Professor of Neurology; Investigator, Center for Molecular Neuroscience

The Joe B. Wyatt Distinguished University Professor Award, created to honor Chancellor Wyatt upon his retirement in 2000, recognizes the development of significant new knowledge from research or exemplary innovation in teaching, particularly accomplishments that span multiple academic disciplines. The recipient of this annual award is chosen by the Chancellor from nominations by members of the faculty and carries the title for one year.

- 2001 DOUGLAS FUCHS, Professor of Special Education; Co-Director, Research Program on Learning Accommodations for Individuals with Special Needs, John F. Kennedy Center
- LYNN S. FUCHS, Professor of Special Education; Co-Director, Research Program on Learning Accommodations for Individuals with Special Needs, John F. Kennedy Center
- 2002 JUDY G. OZBOLT, Independence Chair in Nursing; Professor of Nursing; Professor of Biomedical Informatics
- 2003 PAUL A. COBB, Professor of Education
- 2004 MARSHALL C. EAKIN, Professor and Chair of History
- 2005 GARY F. JENSEN, Professor of Sociology and Chair of the Department; Professor of Religious Studies
- 2006 SANKARAN MAHADEVAN, Professor of Civil and Environmental Engineering; Professor of Mechanical Engineering
- 2007 KENNETH A. WALLSTON, Professor of Psychology in Nursing; Professor of Psychology, Peabody College; Professor of Psychology, College of Arts and Science; Member, Vanderbilt Kennedy Center for Research on Human Development
- 2008 DAVID CHARLES WOOD, Centennial Professor of Philosophy; Professor of Philosophy

University Professorships

HOUSTON A. BAKER, JR., University Distinguished Professor of English
 JAMES F. BLUMSTEIN, University Professor of Law and Medicine
 JOHN C. GORE, Chancellor's University Professor of Radiology and Radiological Sciences, Biomedical Engineering, Molecular Physiology and Biophysics, and Physics
 GEORGE M. HORNBERGER, University Distinguished Professor of Civil and Environmental Engineering and Earth and Environmental Sciences
 PETER LAKE, University Professor of History and the History of Christianity
 W. KIP VISCUSI, University Distinguished Professor of Law, Economics, and Management
 JOHN P. WIKSWO, Gordon A. Cain University Professor of Physics, Biomedical Engineering, and Molecular Physiology and Biophysics

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 ELLEN T. ARMOUR, E. Rhodes and Leona B. Carpenter Chair in Feminist Theology
 CARLOS L. ARTEAGA, Vice Chancellor's Professor of Breast Cancer Research
 DAVID M. BADER, Gladys Parkinson Stahlman Chair in Cardiovascular Research
 H. SCOTT BALDWIN, Katrina Overall McDonald Professor of Pediatrics
 JEFFREY R. BALSER, James Tayloe Gwathmey Clinician Scientist
 BRUCE BARRY, Brownlee O. Currey Professor of Management (Organization Studies)
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TOM DILLEHAY, Distinguished Professor of Anthropology
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JAMES W. ELY, JR., Milton R. Underwood Chair in Free Enterprise
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EMMANUELE DIBENEDETTO, Centennial Professor of Mathematics
JOHN HALPERIN, Centennial Professor of English
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