Vanderbilt University Graduate School

www.vanderbilt.edu/gradschool

VANDERBILT

Graduate School

Vanderbilt
University
2010/2011

Containing general information
and courses of study for the
2010/2011 session corrected
to 25 June 2010 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 website at *www.vanderbilt.edu/student_handbook*.

NONDISCRIMINATION STATEMENT
In compliance with federal law, including the provisions of Title VII of the Civil Rights Act of 1964, Title IX of the Education Amendment of 1972, Sections 503 and 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act (ADA) of 1990, the ADA Amendments Act of 2008, Executive Order 11246, the Uniformed Services Employment and Reemployment Rights Act, as amended, and the Genetic Information Nondiscrimination Act of 2008, Vanderbilt University does not discriminate against individuals on the basis of their race, sex, religion, color, national or ethnic origin, age, disability, military service, or genetic information in its administration of educational policies, programs, or activities; admissions policies; scholarship and loan programs; athletic or other university-administered programs; or employment. In addition, the university does not discriminate against individuals on the basis of their sexual orientation, gender identity, or gender expression consistent with the university's nondiscrimination policy. Inquiries or complaints should be directed to the Equal Opportunity, Affirmative Action, and Disability Services Department, Baker Building, PMB 401809, Nashville, TN 37240-1809. Telephone (615) 322-4705 (V/TDD); FAX (615) 343-4969.

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Graduate School Calendar 2010/2011

FALL SEMESTER 2010

Classes begin / Wednesday 25 August
Last day to submit Intent to Graduate forms for December graduation / Friday 17 September
Fall break / Thursday 14 October–Friday 15 October
Homecoming and related activities / Monday 18 October–Saturday 23 October
Last day to withdraw from courses without academic penalty / Friday 22 October
Thanksgiving holidays / Saturday 20 November–Sunday 28 November
Final day for submission of theses and dissertations to the Graduate School for graduation in December / Friday 3 December
Reading days and examinations / Friday 10 December–Saturday 18 December
Fall semester ends / Saturday 18 December

SPRING SEMESTER 2011

Classes begin / Wednesday 12 January
Last day to submit Intent to Graduate forms for May graduation / Monday 7 February
Spring holidays / Saturday 5 March–Sunday 13 March
Last day to withdraw from courses without academic penalty / Friday 18 March
Final day for submission of theses and dissertations to the Graduate School for graduation in May / Monday 28 March
Reading days and examinations / Wednesday 27 April–Thursday 5 May
Commencement / Friday 13 May

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Last day to submit Intent to Graduate forms for August graduation / Friday 17 June
Final day for submission of theses and dissertations to the Graduate School for graduation in August / Friday 22 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 5,600 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 47 percent are women, and 25 percent come from foreign countries.

The University

Commodore 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 3,000 full-time members and a diverse student body of more than 12,500. 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 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, Master of Science in Nutrition and Dietetics (proposed for fall 2011), Doctor of Nursing Practice.
Owen Graduate School of Management. Master of Accountancy, Master of Business Administration, Master of Management in Health Care, 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 University 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 Libraries

The Jean and Alexander Heard Library System

Vanderbilt University's libraries are among the top research libraries in the nation. Home to more than eight million items, the libraries hold more than 3.5 million volumes, 3.1 million microform items, and 1.2 million locally created digital collections. Our oldest manuscript in the collection dates from c. 1300, and new publications are being added every day. Among the libraries' collection strengths are the W. T. Bandy Center for Baudelaire and Modern French Studies, a comprehensive collection of materials on Charles Baudelaire and French literature and culture; the Southern Literature and Culture Collection; Latin American collections for Brazil, Colombia, the Andes, Mesoamerica, and Argentina; the Television News Archive, the world's most extensive and complete archive of television news covering 1968 to present; the Revised Common Lectionary, one of the first published Web-based resources of scriptural readings for the liturgical year; and the Global Music Archive, a multimedia reference archive and resource center for traditional and popular song, music, and dance of Africa and the Americas.

The libraries' website provides access to tens of thousands of full-text journals, as well as indexes and other research resources, and is accessible remotely via the campus network and from 750 workstations in campus libraries. The libraries' homepage receives more than 3,750,000 visits annually. Resources may be located through Acorn, the libraries' online catalog, and through DiscoverLibrary, the libraries' new information discovery tool. Our knowledgeable staff provides a range of student services, including reference, circulation, discipline-specific instruction, and research consultations. Online reference is available through *www.library.vanderbilt.edu/askus.*

Campus libraries contain discipline-specific collections and are designed to provide expert support in that area of study. Options for individual study are complemented by group study spaces and instructional rooms, as well as a learning commons. The Commodore Card grants access to all of these resources.

Information Technology Services

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

ITS maintains and supports VUnet, the campuswide data network that provides access to the Internet, and VUnetID, the authentication service that enables Vanderbilt users to securely identify themselves to many services on VUnet. Those services include YES, Your Enrollment Services; Online Access to Knowledge (OAK); VUspace, the university's network file storage system; and Vmail, the university's email system. Vmail also includes VUmailguard, designed to protect your email from viruses, unwanted mail (spam), and high-risk attachments.

ITS maintains the campus phone (voice) network, including personal phone lines for resident students. 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 discount information see *its.vanderbilt.edu/cellphone.*

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 highlights VUmix, legal, safe, inexpensive, and easy ways to explore and share music and digital content. See *digitallife.vanderbilt.edu* and *www.vanderbilt.edu/vumix* for details.

ITS offers various conferencing and collaboration services for students. Vanderbilt's blog service offers Wordpress Blogs at *blogs.vanderbilt.edu.* Centra web conferencing, a pilot for Microsoft Office Communicator and Live Meeting, audio and video conferencing via desktop or a Polycom bridge, and the ITS podcast studio are just a few of the services available. See *its.vanderbilt.edu/services/collaboration* for more information.

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 and computing at Vanderbilt, go to *its.vanderbilt.edu.*

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 website at *www.vanderbilt.edu/cft* or call (615) 322-7290.

Interdisciplinary Centers, Institutes, and Research Groups

Vanderbilt actively promotes research and teaching that crosses disciplines, departments, and institutional lines through a multitude of centers, institutes, and research groups. Below is a sampling of interdisciplinary initiatives at the university and medical center. For more information, see *www.vanderbilt.edu/researchers.html.*

The Cal Turner Program for Moral Leadership in the Professions works to develop the leadership and ethical capacities of those serving in the professions. CTP brings together professionals from a range of disciplines to take on significant social challenges and fosters within Vanderbilt's students and its broader constituents a deep sense of vocation, encouraging professionals to remember the deeper purposes that motivate their work. *www.vanderbilt.edu/ctp*

The Center for Community Studies brings together academic researchers with community partners to critically evaluate problems of modern society such as homelessness, ineffective schools, youth violence, inadequate health care, and distressed families, with the goal of supporting and promoting positive human, social, and economic development. The goal of the center is two-fold: to support social inclusion, social justice, and human flourishing, and to develop new theories and bodies of knowledge that will inform this mission. *peabody.vanderbilt.edu/Center_for_Community_Studies.xml*

The Center for Integrative and Cognitive Neuroscience investigates the relationship between brain function, behavior, and cognition, and promotes th e development of new technologies like advanced prosthetics and autonomous robots. Brain scientists, psychologists, clinicians, and engineers collaborate on research and educate undergraduate and graduate students in a wide range of fields. *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, and reaches thousands in Nashville and the surrounding region through various outreach programs to the educational, business, medical, and media communities. *www.vanderbilt.edu/clas*

The Center for Medicine, Health, and Society integrates studies of the humanities, social sciences, and academic medicine in order to examine the role of health and health care in contemporary society. The center offers undergraduate and graduate programs of study. *www.vanderbilt.edu/mhs*

The Curb Center for Art, Enterprise, and Public Policy is a national policy center conducting research and fostering dialogue that examines the practices, laws, regulations, and norms shaping creative enterprise and expressive life in America. The Curb Center also is a leader in the national movement to make creativity and expressive life central to campus life. As a catalyst of Vanderbilt's Creative Campus initiative, the center translates ideas into practice and reflects on our experiences to provide an action research perspective to this burgeoning field. *www.vanderbilt.edu/curbcenter*

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. *www.vanderbilt.edu/euro*

The Robert Penn Warren Center for the Humanities promotes interdisciplinary research and study in the humanities, social sciences, and natural sciences. Members of the Vanderbilt community representing a wide variety of specializations take part in the center's programs, which are designed to intensify and increase interdisciplinary discussion of academic, social, and cultural issues. The center also engages in outreach to the community by sponsoring teacher training, lectures, and seminars. *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.vanderbiltbillwilkersoncenter.com*

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 Institute for Energy and Environment considers social, economic, legal, and technical aspects of environmental and energy problems to find solutions that are practical, achievable, and cost-effective. A crucial part of its mission is to train the next generation of leaders in the energy and environmental arena. *www.vanderbilt.edu/viee*

The Vanderbilt Institute for Integrative Biosystems Research and Education fosters and enhances interdisciplinary research in the biophysical sciences and bioengineering at Vanderbilt, integrated with a strong focus on undergraduate, graduate, and postdoctoral education. VIIBRE's mission is to invent the tools and develop the skills that are required to understand biological systems across spatiotemporal scales. VIIBRE's research and educational programs focus on an integrated multidisciplinary approach to microscale engineering and instrumentation for dynamic control and analysis of biological systems, i.e., instrumenting and controlling the single cell and small cell populations. *www.vanderbilt.edu/viibre*

The Vanderbilt Institute of Chemical Biology, a transinstitutional initiative between the College of Arts and Science and the School of Medicine, 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. Research encompasses students and faculty in various areas of nanoscience, with a special emphasis on interdisciplinary activities. *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 four broad areas: basic mechanisms of nervous system development, cognitive processes and interventions, mental health dysfunction and intervention, and life impact of disabilities on individuals and families. The center includes the Treatment and Research Institute for Autism Spectrum Disorders. 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 and through Mid-Tennessee Interdisciplinary Instruction in Neurodevelopmental Disabilities, a national Leadership Education in Neurodevelopmental Disabilities interdisciplinary training program for health professionals. *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.vuiis.vanderbilt.edu*

Other initiatives include:

Advanced Computing Center for Research and Education
African American Mental Health Research Scientist Consortium
American Economic Association
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 Constructive Approximation
Center for Evaluation and Program Improvement
Center for Experiential Learning and Assessment
Center for Human Genetics Research
Center for Intelligent Systems
Center for Matrix Biology
Center for Molecular Neuroscience
Center for Patient and Professional Advocacy
Center for Research on Rural Families and Communities
Center for Science Outreach
Center for Structural Biology
Center for Teaching
Center for U.S.-Japan Studies and Cooperation
Center in Molecular Toxicology
Child and Family Center
Child and Family Policy Center
Clinical Research Center
Clinical Trials Center
Cognitive Robotics Lab
Digestive Disease Research Center
Division of Sponsored Research
eLab
English Language Center
Experimental Education Research Training (ExpERT) Program
Family-School Partnership Lab
Financial Markets Research Center
Freedom Forum First Amendment Center at Vanderbilt University
Informatics Center
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 and Biological Sciences (IGP)
Interdisciplinary Program in Education Psychology (IPEP)
IRIS Center for Training Enhancements
Kelly Miller Smith Institute on Black Church Studies
Lamb Center for Pediatric Research
Laser Diagnostics and Combustion Group
Latin American Public Opinion Project
Law and Business Program
Law and Economics Ph.D. Program
Margaret Cuninggim Women's Center
Mass Spectrometry Research Center
National Center on Performance Incentives
National Center on School Choice
National Research Center on Learning Disabilities
Owen Entrepreneurship Center
Peabody Research Institute
Principals' Leadership Academy of Nashville
Radiation Effects and Reliability Group
Skin Diseases Research Core Center
Study of Mathematically Precocious Youth
Susan Gray School
Tennessee Lions Eye Center
Tennessee Poison Center
Turner Center for Church Leadership and Congregational Development
Vanderbilt Addiction Center
Vanderbilt Breast Center
Vanderbilt Burn Center
Vanderbilt Center for Better Health
Vanderbilt Center for Environmental Management Studies
Vanderbilt Center for Integrative Health
Vanderbilt Center for Stem Cell Biology
Vanderbilt Diabetes Research and Training Center
Vanderbilt Engineering Center for Transportation Operations and Research
Vanderbilt Executive Development Institute
Vanderbilt George O'Brien Renal Center
Vanderbilt-Ingram Cancer Center
Vanderbilt Institute for Global Health

Vanderbilt-Meharry Center for AIDS Research
Vanderbilt-Northwestern-Texas-Harvard/MIT Engineering Research Center for Bioengineering Educational Technologies
Vanderbilt Programs for Talented Youth
Vanderbilt Sleep Disorders Center
Vanderbilt Transplant Center
Vanderbilt Vaccine Center
Vanderbilt Vision Research Center
Vanderbilt Voice Center
W. T. Bandy Center for Baudelaire and Modern French Studies

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, go to *www.vanderbilt.edu/gradschool.*

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/Main/*). 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 website by early July for suggestions and guidance. The website 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, VU meal plans, 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, go to *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 Sarratt Student Center) and The Commons Dining Center. Six convenience stores on campus offer grab-and-go meals, snacks, beverages, and groceries. All units accept the Commodore Card. For hours and menus, go to *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 website 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 website 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 website at *virg.vanderbilt.edu.* Select "Factbook," then "Student," then "Retention/Graduation Rates." Paper copies of information about graduation rates may be obtained by writing the Office of the University Registrar, Vanderbilt University, PMB 407701, 2301 Vanderbilt Place, Nashville, Tennessee 37240-7701 or by calling (615) 322-7701.

The Vanderbilt University Annual Security Report on university-wide security and safety, including related policies,

procedures, and crime statistics, is available from the Vanderbilt University Police Department on the university website at *police.vanderbilt.edu/security_report.* A paper copy of the report may be obtained by writing the Vanderbilt University Police Department, 2800 Vanderbilt Place, Nashville, Tennessee 37212 or by calling (615) 343-9750. For more information, see "Vanderbilt University 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 website 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, PMB 407701, 2301 Vanderbilt Place, Nashville, Tennessee 37240-7701 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); contractors, consultants, and other outside service providers 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, email 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 email address. 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. Students who have placed a directory hold with the University Registrar will not be listed in the online directory. Directory information should be kept current. Students may report address changes, emergency contact information, and missing person contact information via the Web by selecting the address change icon at *https://webapp.mis.vanderbilt.edu/student-search.*

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 website, *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 full time 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, go to *www.vanderbilt.edu/career.*

Additionally, the VCC partners with the Peabody Career Center, Owen Career Management Center, and Owen Special Programs to support students enrolled in a professional master's program in Peabody College or in 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: 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. Most visits are free of charge, but there are small co-pays for some procedures, and for medications or supplies purchased at the Student Health Center.

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).*

Immunization Requirements

The State of Tennessee requires certain immunizations for all students (undergraduate, graduate, and professional) on university campuses. As such, Vanderbilt University will block student registration for those who are not in compliance with the requirements. In order to accommodate students who have difficulty acquiring their records or needed vaccinations, incoming students not in compliance with the state laws will be enrolled for their first semester, but if they fail to comply within two months of enrollment, registration for the second semester will not be permitted.

The requirements include:

1. *Meningococcal meningitis vaccine (one injection)* for all incoming students living in on-campus housing. The law does allow a student to sign a waiver stating that he/she does not wish to receive this vaccination (see below).
2. *Hepatitis B vaccine series (three injections)* for all incoming students, regardless of housing status. The law does allow a student to sign a waiver stating that he/she does not wish to receive this vaccination (see below).
3. *Measles, mumps, and rubella (two injections)* for all incoming students. Any waivers for this vaccine are very strict, and include only certain religious or medical exemptions that must be approved by the medical director of the Student Health Center.

The Student Health Center asks all incoming students to complete a Health Questionnaire that includes further information regarding the state-mandated vaccinations, as well as information on other strongly recommended vaccinations. Information regarding this Health Questionnaire

is communicated to students by email after admission to Vanderbilt University. This Health Questionnaire must be returned to the Student Health Center with vaccination or waiver information. Waivers for hepatitis B and the meningococcal vaccine are also included with the Health Questionnaire, should a student decide to forgo these vaccinations. However, waiver of the MMR (measles, mumps, rubella) vaccine requires special documentation of religious or medical exemption so students seeking that waiver should contact the medical director of the Student Health Center at (615) 322-2254.

Students should go to *www.vanderbilt.edu/student_health/link/immunization-requirements* in order to access more information regarding the immunization requirements. This site also contains links to the PDFs of the required forms and has information regarding an online entry form that is available for the state-mandated vaccinations.

All vaccines can be administered at either a private provider office or at the Student Health Center.

Student Injury and Sickness Insurance Plan

All students registered in degree programs for 4 or more credit hours or who are actively enrolled in research courses (including but not limited to dissertation or thesis 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 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. Coverage extends from August 12 until August 11 of the following year, whether a student remains in school or is away from the university.

A student who does not want to subscribe to the insurance plan offered through the university must notify the Office of Student Accounts of adequate coverage under another policy. All new and returning students must complete an online selection/waiver process through the Office of Student Accounts (*www.vanderbilt.edu/stuaccts)* or via the insurance company (*www.gallagherkoster.com).* This process must be completed by August 1 for students enrolling in the fall for annual coverage. Newly enrolled students for the spring term must complete the online waiver process by January 6. The online selection/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) 322-4688. 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 injury and sickness insurance. 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 website 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 Vanderbilt Sitter Service connects members of the Vanderbilt community who wish to provide sitting services with those who need the services.

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 website.

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 Equal Opportunity, Affirmative Action, and Disability Services Department. 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 Equal Opportunity, Affirmative Action, and Disability Services Department also investigates alleged violations of Vanderbilt's nondiscrimination and anti-harassment policies. Specific concerns pertaining to services for people with disabilities or any disability issue should be directed to the Disability Program Director, Equal Opportunity, Affirmative Action, and Disability Services Department (EAD), PMB 401809, 2301 Vanderbilt Place, Nashville, Tennessee 37240-1809; phone (615) 322-4705 (V/TDD); fax (615) 343-0671; *www.vanderbilt.edu/ead.*

Vanderbilt University Police Department

The Vanderbilt University 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 Vanderbilt University 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 Vanderbilt University Police Department provides comprehensive law enforcement and security services to all components of Vanderbilt University including the academic campus, Vanderbilt University 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 Vanderbilt University 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 Vanderbilt University Police Department provides several services and programs to members of the Vanderbilt community:

Vandy Vans—The Vanderbilt University 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/vandy_vans* 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 VUPD 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 VUPD 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 email lists, and through the department's webpage, *police.vanderbilt.edu.*

Educational and Assistance Programs—The Community Relations Division of Vanderbilt University 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 visit *police.vanderbilt.edu.* Additional information on security measures and crime statistics for Vanderbilt is available from the Vanderbilt University 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 University Police Department, 2800 Vanderbilt Place, Nashville, Tennessee 37212 or by telephone at (615) 343-9750. You may also obtain this report on the website at *police.vanderbilt.edu/security_report.*

Parking, Vehicle Registration, and Alternative Transportation

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.

All Graduate School students can ride to and from the Vanderbilt campus free of charge on Nashville's Metropolitan Transit Authority buses. To utilize this service, a valid student ID card is required for boarding the bus.

Graduate Development Network

The Graduate Development Network (GDN) 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 network's website (*www.vanderbilt.edu/gradschool/gdn)* 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 BJJBCC 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 provides the campus with additional opportunities to learn about world cultures and to celebrate diversity. International Lens film series brings more than fifty international films to campus each year. 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

As part of the Office of the Dean of Students, the Margaret Cuninggim Women's Center welcomes all members of the Vanderbilt community to take part in our events and resources related to women's and gender topics. Our Gender Matters program offers co-curricular programming aimed to increase awareness of the influence that gender has in our lives; in addition, Gender Matters provides individual support and advocacy around a variety of issues, including gender stereotyping, gender equity, body image, eating disorders, pregnancy and reproduction, sexual health, and more. Project Safe is a support and resource referral hub for those affected by power-based personal violence (sexual assault, partner violence, stalking, and bias-related violence). Through the Green Dot violence prevention campaign, we also coordinate a campus-wide effort to involve all members of the Vanderbilt community in creating a safer campus. In addition, the Women's Center houses resources related to gender issues and produces *Women's VU,* a magazine that foregrounds women at Vanderbilt and highlights contributions made for and by women and their allies. The Women's Center is open Monday through Friday, 8 a.m. to 5 p.m. and is located at 316 West Side Row. For more information, please call (615) 322-4843.

Office of LGBTQI Life

As a component of Vanderbilt's Office of the Dean of Students, the Office of Lesbian, Gay, Bisexual, Transgender, Queer, and Intersex (LGBTQI) Life is a welcoming space for individuals of all identities and a resource for information and support about gender and sexuality. LGBTQI Life serves the entire Vanderbilt community through education, research, programming, support, and social events. Visitors are invited to use our ever-expanding resource library for research around LGBTQI issues and culture. In addition, LGBTQI Life conducts tailored trainings and consultations for the campus and community. In all cases the office staff provides confidentiality. The Office of LGBTQI Life is located in the K. C. Potter Center, Euclid House, 312 West Side Row. For more information, please call (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 email *hillel@vanderbilt.edu*.

Religious Life

The Office of Religious Life provides opportunities for students, faculty, and staff to explore religion, faith, spirituality, personal values, and social responsibility via educational programming, religious and spiritual praxis, encounters with various faith perspectives, and engagement with religious and spiritual communities. The office serves "the religious" and those who identify as "nonreligious." Religious Life is an intellectual home and ethical resource for anyone in the Vanderbilt community seeking to clarify, explore, and deepen understanding of their lives.

Recognizing the importance of exploring one's faith in community, the Office of Religious Life facilitates opportunities for individuals of a shared faith to gather and engage in

the rites, rituals, and practices of their particular religious tradition. Whether guided by one of our affiliated chaplains or a student-run religious organization, these groups foster a sense of community and common values. For a complete listing of campus religious groups, resources, services, and programming opportunities, visit *www.vanderbilt.edu/religiouslife.*

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 Center Smoothie, and leads directly to Rand Dining Center, the Varsity Market, and the Vanderbilt Bookstore. The Vanderbilt Programming Board plans concerts, film screenings, classes, speakers, receptions, gallery showings, and many other events throughout the campus. The center's Info 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, 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, 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 *www.vanderbilt.edu/campusrecreation.*

Academic Programs

THE Graduate School accepts candidates for advanced degrees in fifty-six fields. The following table lists degree programs and the degrees available. Please note that many of the programs listed below awarding 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*
Anthropology	X	X	37
Astronomy	X		63
Biochemistry	X*	X	38
Biological Sciences	X*	X	38
Biomedical Engineering	X	X	39
Biomedical Informatics	X	X	39
Cancer Biology	X*	X	40
Cell and Developmental Biology	X*	X	41
Cellular and Molecular Pathology	X*	X	41
Chemical and Biomolecular Engineering	X	X	42
Chemical and Physical Biology		X	42
Chemistry	X	X	43
Civil Engineering	X	X	43
Classics	X		44
Community Research and Action	X*	X	44
Computer Science	X	X	45
Creative Writing (M.F.A.)	X		47
Earth and Environmental Sciences	X		45
Economic Development	X		46
Economics	X*	X	46
Electrical Engineering	X	X	46
English	X*	X	47
Environmental Engineering	X	X	48
Epidemiology		X	48
French	X	X	49
German	X	X	49
Hearing and Speech Sciences		X	50
History	X	X	51
History of Art	X		51
Human Genetics		X	51
Interdisciplinary Materials Science	X	X	52
Latin American Studies	X		53
Law and Economics		X	54
Leadership and Policy Studies		X	55
Learning, Teaching, and Diversity	X*	X	56
Liberal Arts and Science (M.L.A.S.)	X		56
Management		X	56
Mathematics	X	X	57
Mechanical Engineering	X	X	58
Medicine, Health, and Society	X		58
Microbiology and Immunology	X*	X	60
Molecular Physiology and Biophysics	X*	X	60
Neuroscience	X*	X	61
Nursing Science		X	61
Pharmacology	X*	X	62
Philosophy	X	X	63
Physics	X	X	63
Political Science	X	X	64
Portuguese	X		67
Psychology	X*	X	64
Psychology and Human Development	X	X	64
Religion	X	X	65
Sociology	X*	X	66

ACADEMIC PROGRAMS	MASTER'S	Ph.D.	Page
Spanish	X	X	67
Spanish-Portuguese	X*	X	67
Special Education	X*	X	68

* 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

The Graduate Program in Economic Development (GPED) is a professionally oriented master's program in economics preparing students for both domestic and international careers in economic development. The curriculum consists of four core courses in microeconomics, macroeconomics, statistics, and econometrics and four electives in addition to a two-semester research seminar. The research seminar results in students writing the required master's thesis. The program offers courses on a wide range of subjects including: international trade, project evaluation, policy analysis, international trade and development economics. Students may also take courses in other areas of economics, business, finance, and public policy. Field trips take students each year to industries, farms, and communities in the southeastern U.S. as well as to the World Bank, International Monetary Fund, Federal Reserve Board, and the Federal Trade Commission in Washington, D.C.

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. website: *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 Department of Education calculated a composite pass rate of 99 percent for Vanderbilt graduates who completed a teacher education program during the 2006/2007 academic year and who took one or more PRAXIS II examinations 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 in the College of Arts and Science.

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 approval of the department or program.

Programs of Study

The 4+1 option is currently available in the following departments and programs: chemistry; creative writing; 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 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 College of Arts and Science 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, consult the website *www.vanderbilt.edu/4plus1.*

Accelerated Graduate Program in Engineering

Students who enter Vanderbilt with a significant number of credits (20 to 30 hours), earned either through Advanced Placement Tests or in college courses taken during high school, may be eligible for the Accelerated Graduate Program in Engineering. Through this program, a student is able to earn both a bachelor's degree and an M.S. degree in about the same time required for the bachelor's degree. To be eligible for the program a student must complete 86 hours (senior standing) by the end of the sophomore year with at least a 3.5 grade point average. With the approval of the faculty in their major department, students apply through the Associate Dean for Research and Graduate Studies for provisional admission and take one course approved for graduate credit each semester of the junior year. These courses will be credited toward the M.S. degree. Upon successful completion of these courses, the student is admitted to the Graduate School.

During the fourth year the student takes three courses (9 hours) for graduate credit each semester, and the remaining 6 to 10 undergraduate hours required for the bachelor's degree. The student receives the bachelor's degree at the end of the fourth year and spends the summer finishing a master's thesis to complete the M.S. degree. Further information can be obtained from the chair of the student's major department.

Summer Session

Information concerning the summer session may be found on the Graduate School webpages 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 or comparable non-U.S. degrees are eligible for admission to the Graduate School. Applications from international students with three-year bachelor's degrees will also be accepted. 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 website (*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 website for that department or program. Typically, admission decisions for fall semester will be communicated by March 31 to all applicants whose files are complete by January 15.

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

Most programs do not admit students for the spring semester. Please check with the program 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 website 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 Test of English as a Foreign Language is 570, 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 injury and sickness insurance. 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/isss.*

Financial Information

TUITION in the Graduate School for 2010/2011 is charged at the rate of $1,623 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 2010/2011 is $2,436 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	2,142
Student activities and recreation fees	386
Transcript fee (one time only)	30
Late registration	30
Audit fee for regular students (nonrefundable)	10
Ph.D. dissertation publication (microfilming)	65
Thesis or dissertation binding (per copy)	19
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 18 for the fall semester and January 6 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. If payment is not made within that time, cancellation of V-Net (long distance telephone) access and cell phone for campus residents may result and additional charges to flexible spending accounts may be prohibited. Visit *www.vanderbilt.edu/stuaccts* for payment options.

Students/Guarantors will be responsible for payment of all cost, 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

The Office of Student Accounts now utilizes electronic billing. Bills generated for October, February, March, May, and June will not be mailed. For these months, students who have a Student Accounts bill should access their bills electronically. Beginning July 1, 2011, paper invoices will no longer be printed and mailed. For additional enrollment information, please visit *www.vanderbilt.edu/stuaccts.*

When a new bill is available for viewing, students (and previously enrolled payers) will receive an email notification each month (except September and January in which no bills are generated). Students may invite other "payers" who would also receive email notifications when new bills are available.

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) students and their designated user(s) will receive an email along with the e-billing logon link; there will, therefore, be no more delays in receiving Student Accounts invoices due to mail processing time. Plus invoices can be viewed and payments can be made simply and securely from one website. Students who choose to make an online payment will receive a confirmation email for their records. Students who prefer to mail the payment can print the bill and return the top portion or payment coupon along with payment to the remittance address on the invoice. Payments are due on the specified due date to avoid a late payment fee.

The e-bill includes a recent activity tab of updates to the student account since the last bill.

Refunds of Tuition Charges

University policy for the refund of tuition and housing charges provides a percentage refund based on the time of withdrawal. Students who withdrew officially or who are dismissed from

the university for any reason may be entitled to a partial refund in accordance with the established schedule below. Fees are nonrefundable.

Fall 2010 Withdrawal/Refund Schedule

Week 1	August 25–August 28	100%
Week 2	August 29–September 4	95%
Week 3	September 5–September 11	90%
Week 4	September 12–September 18	80%
Week 5	September 19–September 25	75%
Week 6	September 26–October 2	70%
Week 7	October 3–October 9	60%
Week 8	October 10–October 16	55%
Week 9	October 17–October 23	50%
Week 10	October 24–October 30	40%

No refund after October 30, 2010

Spring 2011 Withdrawal/Refund Schedule

Week 1	January 12–January 15	100%
Week 2	January 16–January 22	95%
Week 3	January 23–January 29	90%
Week 4	January 30–February 5	80%
Week 5	February 6–February 12	75%
Week 6	February 13–February 19	70%
Week 7	February 20–February 26	60%
Week 8	February 27–March 4	55%
Spring Break	March 5–March 13	
Week 9	March 14–March 21	50%
Week 10	March 22–March 26	40%

No refund after March 26, 2011

Payment Options

Direct Payment: Tuition, fees, and all other charges are paid directly to the university. Payment for the fall semester is due by August 18, 2010. Payment for the spring semester is due by January 6, 2011. Students can pay online after viewing their bill at *www.vanderbilt.edu/stuaccts.* There is no further action required for this option.

Interest-Free Monthly Payment: Students can spread payment over ten monthly installments, interest free, by enrolling in the VANDYPlan, administered by Sallie Mae. The deadline to enroll in the VANDYPlan is July 15, 2010 (payments begin May 15). Enroll at *www.TuitionPayEnroll.com/Vanderbilt.*

The current estimated charges for the 2010/2011 academic year are available at *www.vanderbilt.edu/stuaccts* to assist students in determining their annual expenses. For further information, please contact the Office of Student Accounts at (615) 322-6693 or (800) 288-1144.

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. Students who reside beyond an approximate sixty-mile radius from campus as determined by ZIP code and students who want to have fees waived due to exceptional circumstances must petition in writing for a waiver through the Office of Recreation Administration, PMB 406206, 2301 Vanderbilt Place, Nashville, Tennessee 37240-6206. A waiver request form may be obtained by emailing *waiverscommittee@vanderbilt.edu* or by calling (615) 322-3963. A $10 late fee is assessed to eligible students who apply for waivers after August 19 for the fall semester and January 7 for the spring semester. No waivers are granted after the end of the semester in which the fee occurs, and per the *Student Handbook,* **there are no waivers of the summer activity and recreation fees.**

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 departmental 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 departmental 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 $32,000 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 $21,000 for nine months or $26,664 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 $32,400 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 $30,000 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, Economic Development, 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 interdepartmental graduate programs of study. Traineeships provide stipends up to $22,000 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 webpage, *www.vanderbilt.edu/financialaid/gradprof.htm.*

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 website, *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 binding fee of $19 per copy.

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) website. 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 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 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. Electronic submission is encouraged. 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) website, *etd.library.vanderbilt.edu.*

Dissertations are intended to be of benefit to the academic community and to society in general, and thus are required to be publicly available. This is accomplished by placing a copy in the Vanderbilt Heard Library, posting an electronic version on the library website, and by filing with ProQuest for inclusion in an accessible database. In some instances, students may request a delay in the release or posting of their dissertations for a limited time period. This can be done, for example, to protect intellectual property, to allow time to file a patent application, or to coordinate with the timing of publication in another form. In no circumstance will the release of the dissertation be delayed for more than two years. Unless requested for a shorter period of time, any request to delay public release will expire at the end of two years and the Graduate School will proceed with the public release through the library.

All dissertations 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. For students who choose to have their dissertation copyrighted, the Graduate School will help facilitate the process. 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 YES (Your Enrollment Services). 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, including those receiving scholarship, assistantship, fellowship, or traineeship support through the university, must register each fall and spring semester with no breaks in registration to remain in good standing.

Changes in Registration

Changes in registration may be made through YES 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 except under certain circumstances. Failing the course is not considered one of the circumstances. 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		

S/U grades are given every semester for all research courses (369, 379, and 399), regardless of the number of hours registered. The accumulation of three (3) *U* grades over the course of study will lead to dismissal from the program and the Graduate School.

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. Accumulation of three *U* grades in research courses can lead to dismissal.

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 these cases, students should complete a "Request for Graduate Credit" form. 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

Students admitted as 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 petition the department, who on their behalf apply to the Graduate School for 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 petition 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 academic and 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. Financially clear students unable to participate in the graduation ceremony will receive their diplomas by mail.

Programs of Study

African American and Diaspora Studies

DIRECTOR Tracy D. Sharpley-Whiting
DIRECTOR OF GRADUATE STUDIES Tiffany R. Patterson
PROFESSORS Victor Anderson, Tracy D. Sharpley-Whiting
ASSOCIATE PROFESSORS Trica Keaton, Tiffany R. Patterson
ASSISTANT PROFESSORS Anastasia Curwood, Gilman W. Whiting
WRITER-IN-RESIDENCE Alice Randall

VANDERBILT University's African American and Diaspora Studies program offers an interdisciplinary, cross-cultural, and comparative curriculum of study of the histories, literatures, music, visual cultures, and politics of people of African descent around the world. To that end, the African American and Diaspora Studies program focuses on several geographic areas: Africa, Europe, the Americas, and the Caribbean. The certificate in diaspora studies has been designed to complement students' disciplinary training, expose them to the interdisciplinary trends in the academy, and broaden their career possibilities. The diaspora studies certificate provides graduate students with access to interdisciplinary scholarship in the dynamic and continually evolving field of studies in the worldwide African diaspora. The certificate also gives students a competitive edge and interdisciplinary training for the still robust career outlook for specialists in pan-black studies as well as in the search for postdoctoral fellowships in the humanities and social sciences.

The certificate in diaspora studies is open to any student enrolled in graduate study at Vanderbilt University. Acceptance to the program requires the approval of the African American and Diaspora Studies program graduate studies committee, comprised of the director of graduate studies, one faculty member from African American and Diaspora Studies, and the director of African American and Diaspora Studies. Students must also submit as part of the application to the certificate program a one-page description of their interests in diaspora studies. Students should also submit a letter of approval with respect to the certificate from their faculty adviser or their departmental director of graduate studies. The letter should speak as well to the student's standing in the department. Courses taken at Vanderbilt University prior to admission to the program may be counted toward the certificate requirements with the approval of the African American and Diaspora Studies program's director of graduate studies. The conferral of the certificate requires an overall GPA of 3.3, satisfactory performance of B+ or better in AADS 300, completion of all distribution requirements with a B+ or better, and a "pass" on the graduate certificate paper.

For more detailed information on the diaspora certificate, please go to *www.vanderbilt.edu/aframst* or contact the director of graduate studies in the African American and Diaspora Studies program.

Requirements for the Graduate Certificate in Diaspora Studies

1. African American and Diaspora Studies 300.
2. Four additional graduate-level courses on race and its intersection with gender, class, religion, power, and/or sexuality, which are appropriate to the student's graduate program of study, are eligible. All courses must be approved for credit by the African American and Diaspora Studies program graduate committee, and include at least three courses outside the student's home discipline. Students will be required to provide a copy of course syllabi to the graduate committee so that the committee may determine whether the courses taken or proposed to be taken by the student are indeed appropriate for certificate credit. One course may be satisfied through an independent study (AADS 395 Directed Study) with a core or affiliated faculty member in African American and Diaspora Studies.
3. A paper (thirty-five pages) submitted to the African American and Diaspora Studies program graduate committee for evaluation. The paper must be comparative and cross-cultural in keeping with the certificate's diasporic emphasis. Moreover, the final paper must build upon work explored in AADS 300, AADS 395, or another course approved for certificate credit. The committee will assess the paper on a pass/fail basis.

Approved List of Courses

AFRICAN AMERICAN AND DIASPORA STUDIES: 300, Theories of Diaspora; 395, Directed Study.

ANTHROPOLOGY: 349, The Historical Archaeology of Latin America.

ENGLISH: 320, Studies in American Literature; 321, Studies in Southern Literature; 325, Seminar in Modern British and American Literature; 337a, Introduction to Literary Theory; 350, Special Problems in English and American Literature; 355, Special Topics in English and American Literature.

FRENCH: 388, Seminar in Francophone Literature.

GERMAN: 395, The Racial Imagination.

HISTORY: 305, Studies in Comparative History; 340, Urban History; 358, Comparative Slavery in the Colonial Americas; 359, Atlantic World History, Fifteenth to the Nineteenth Century; 360, Studies in Imperialism and the Colonial Other; 361, Topics in Latin American History; 365, Seminar in Latin American History; 371, Studies in Early American History to 1783; 372, Studies in the Middle Period of American History, 1783–1861; 373a, Studies in United States History, 1861–1900; 374, Studies in Recent American History; 375, Seminar in Recent American 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.

HISTORY OF ART: 320, Seminar in British Art and Culture; 324, Seminar: Studies in Twentieth-Century Art; 325, Seminar: Studies in American Art.

PHILOSOPHY: 352, Topics in Philosophy (must be AADS-related); 353, Figures in Philosophy (must be AADS-related); 365, Twentieth-Century Philosophy (must be AADS-related).

POLITICAL SCIENCE: 305, Feminist Social and Political Thought; 330, Studies in American Politics; 332, Electoral Behavior and Public Opinion;

333, Political Culture, Opinion, and Behavior.

RELIGIOUS STUDIES: 3134, The Ideology of Race and Gender in the Hebrew Bible; 3214, Women and Religion in America; 3235, African American Religious History; 3239, Roots of American Evangelicalism 1770–1879; 3249, Seminar: Colonial American Religious History; 3415, Feminist/Womanist Ethics; 3442, African American Political Theology; 3535, Black Islam in America; 3538, The Black Church in America; 3822, The Amarna Period; 3852, Slave Thought; 3882, African American Biblical Hermeneutics.

SOCIOLOGY: 302, Contemporary Theory; 331, Survey Analysis on Inequalities and Movements; 333, Survey Seminar on Cultural Sociology; 345, Survey Seminar on Social Stratification.

SPANISH: 314, Introduction to Latin American Colonial Studies; 334, Ordering and Disrupting Fictions in Latin America; 338, Seminar: Studies in Colonial Literature; 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.

Course descriptions begin on page 69.

American Studies

DIRECTOR Teresa Goddu

VANDERBILT University's American Studies program offers an interdisciplinary graduate certificate. 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*.

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 the American Studies program. (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.

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.

Course descriptions begin on page 69.

Anthropology

CHAIR Lesley Gill
DIRECTOR OF GRADUATE STUDIES John Janusek
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 Markus Eberl, Sergio Romero, Miriam Shakow, Tiffiny 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.

Course descriptions begin on page 69.

Arabic

Course descriptions begin on page 72.

Archaeology

See Anthropology and Classical Studies

Asian Studies

DIRECTOR Ruth Rogaski
PROFESSOR Robert Company
ASSISTANT PROFESSOR Ling Hon Lam
RESEARCH ASSOCIATE Ben Tran

Affiliated Faculty
RESEARCH PROFESSOR James Auer (Center for U.S.–Japan Studies)
ASSOCIATE PROFESSORS Gerald Figal (History), Yoshikuni Igarashi (History), Tracy Miller (History of Art), Ruth Rogaski (History)
ASSISTANT PROFESSORS Jinah Kim (History of Art), Samira Sheikh (History)

A NUMBER of courses are available in Asian languages, social sciences, and humanities for graduate credit.

A partial listing of relevant courses follows. See departmental listings for courses offered in the current academic year.

The members of the Committee on Asian Studies are James Auer (Center for U.S.-Japan Studies), 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).

ASIAN STUDIES: 211, Popular Culture in Modern Japan; 212, Explorations of Japanese Animation; 218, Introduction to Classical Chinese; 220, Modern Chinese Fiction; 225, Sex and Gender in Premodern Chinese Culture; 240, Current Japan-U.S. Relations; 289a–289b, Independent Study; 294a–294b, Special Topics.

CHINESE: 201–202, Elementary Chinese; 214–216, Intermediate Chinese; 231, Chinese Calligraphy; 241–242, Advanced Chinese; 251–252, Readings in Modern Chinese Media; 255–256, Business Chinese.

HISTORY: 206, Japan's Recent Past; 212a, India and the Indian Ocean; 282, Chinese Medicine.

HISTORY OF ART: 247, Himalayan Art: Art of the Divine Abode; 248, The South Asian Temple.

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 Japanese I; 252. Fourth-Year Japanese II.

POLITICAL SCIENCE: 214, The Japanese Political System; 216, The Chinese Political System.

Course descriptions begin on page 72.

Astronomy

See Physics and Astronomy

Biochemistry

INTERIM CHAIR F. Peter Guengerich
DIRECTOR OF GRADUATE STUDIES David Cortez
PROFESSORS EMERITI Harry P. Broquist, Stanley Cohen, Leon W. Cunningham, Benjamin J. Danzo, Willard R. Faulkner, Carl G. Hellerqvist, Robert A. Neal, David E. Ong, Oscar Touster
PROFESSORS Richard N. Armstrong, Richard Breyer, Alex Brown, Jorge H. Capdevila, Richard Caprioli, Graham F. Carpenter, Bruce Carter, Walter Chazin, David Cortez, Martin Egli, Stephen Fesik, F. Peter Guengerich, David Hachey, Scott W. Hiebert, Billy Hudson, Tadashi Inagami, Daniel C. Liebler, Terry P. Lybrand, Lawrence J. Marnett, Neil Osheroff, James G. Patton, John A. Phillips III, Jennifer Ann Pietenpol, Ned Porter, Carmelo Rizzo, Charles R. Sanders, Samuel A. Santoro, Kevin L. Schey, Virginia L. Shepherd, Michael Stone, Gary Sulikowski, Conrad Wagner, Michael R. Waterman
RESEARCH PROFESSORS Essam E. Enan, Edward T. Olejniczak
ADJUNCT PROFESSORS Kip Guy, Dean A. A. Myles, Rafael Radi, Brenda A. Schulman
ASSOCIATE PROFESSOR Thomas N. Oeltmann
RESEARCH ASSOCIATE PROFESSORS David Friedman, Amy Joan Ham, Galina Lepesheva, Zigmund Luka, Raymond L. Mernaugh, Jarrod Smith
ASSISTANT PROFESSORS Brian Bachmann, Edward Chekmenev, Brandt Eichman, Tina Iverson, Borden Lacy, Andrew Link, Zu-Wen Sun, David Tabb
RESEARCH ASSISTANT PROFESSORS Gerald Frank, Joel M. Harp, Taekyu Lee, Hong-Jun Liao, Olivia Rossanese, W. Hayes McDonald, Laura S. Mizoue, Rekha Pattanayek, Jason Phan, Michelle Reyzer, Erin Seeley, Oleg Tikhomirov, Jashim Uddin, Audrey I. Zavalin, Bin Zhao, 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, 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 detoxication; oxygenase and arachidonic acid biochemistry; cancer drug development; 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 interdisciplinary training programs, supported by National Institutes of Health training grants, to offer specialized biochemical training in the areas of molecular toxicology, chemical biology, biochemical nutrition, molecular biophysics, cancer research, reproductive biology, and molecular endocrinology.

Course descriptions begin on page 73.

Biological Sciences

CHAIR Charles K. Singleton
DIRECTOR OF GRADUATE STUDIES Katherine L. Friedman
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. LeStourgeon, David E. McCauley, Douglas G. McMahon, Terry L. Page, James G. Patton, Charles K. Singleton, Gerald J. Stubbs, Laurence J. Zwiebel
ASSOCIATE PROFESSORS Kenneth C. Catania, Brandt F. Eichman, Katherine L. Friedman, Daniel J. Funk
ASSISTANT PROFESSORS D. Kilpatrick Abbot, Seth Bordenstein, Chang Chung, Nicole Clay, Joshua T. Gamse, Julian Hillyer, Chris Janetopoulos, Daniel J. Kaplan, Antonis Rokas, Donna J. Webb
RESEARCH PROFESSOR Hans-Willi Honegger
RESEARCH ASSOCIATE PROFESSOR Shin Yamazaki
RESEARCH ASSISTANT PROFESSORS Wen Bian, Irina Bruck, Tetsuya Mori, Jeff Rohrbough, Jennifer Ufner, Yao Xu

DEGREE OFFERED: *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 toward 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 website at *sitemason.vanderbilt.edu/biosci* for more information.

Note: The following courses (described in the course listing) 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.

Course descriptions begin on page 74.

Biomedical Engineering

CHAIR Todd D. Giorgio
DIRECTOR OF GRADUATE STUDIES E. Duco Jansen
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. Wikswo
ASSOCIATE PROFESSORS Adam Anderson, Franz Baudenbacher, Mark Does, Anita Mahadevan-Jansen, Michael Miga, Cynthia B. Paschal, David R. Pickens III
ASSISTANT PROFESSOR W. David Merryman

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 a minimum of 27 semester hours of graduate-level didactic courses approved by the program faculty, excluding seminar, research and teaching hours. Candidates must complete 18 hours in biomedical engineering courses (required: BME 301, BME 302, BME 303, BME 304, and BME 305 or their equivalent), six hours in life science (required: physiology (MPB 330), recommended: biochemistry, molecular biology, or cellular biology), and three hours in advanced science or engineering. 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.

Course descriptions begin on page 75.

Biomedical Informatics

CHAIR Daniel R. Masys
DIRECTOR OF GRADUATE STUDIES Cynthia S. Gadd
PROFESSORS Mark E. Frisse, Nunzia B. Giuse, Kevin B. Johnson, Nancy M. Lorenzi, Daniel R. Masys, Randolph A. Miller, William W. Stead (Primary: Medicine)
ASSOCIATE PROFESSORS Dominik Aronsky, Steven H. Brown, Cynthia S. Gadd, Dario A. Giuse, Paul Harris, Edward K. Shultz
ADJUNCT ASSOCIATE PROFESSOR Shawn Levy
ASSISTANT PROFESSORS Erik Boczko, William Bush, Joshua C. Denny, John Doulis, Fern Fitzhenry, William Gregg, Mia Levy, Bradley Malin, Subramani Mani, Asli Ozdas, S. Trent Rosenbloom, Jack Starmer, David L. Tabb, Stuart T. Weinberg, Hua Xu, Bing Zhang, Zhongming Zhao
ADJUNCT ASSISTANT PROFESSORS Constantin F. Aliferis , Russell Waitman
ADJUNCT INSTRUCTOR 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.

Course descriptions begin on page 77.

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.

Course descriptions begin on page 78.

Biophysics

See Molecular Physiology and Biophysics, Physics and Astronomy

Biostatistics

CHAIR Frank E. Harrell, Jr.
DIRECTOR OF GRADUATE STUDIES Jeffrey D. Blume
PROFESSOR EMERITUS Charles F. Federspiel
PROFESSORS William D. Dupont, Frank E. Harrell, Jr., Yu Shyr
ASSOCIATE PROFESSORS Patrick G. Arbogast, Jeffrey D. Blume, Ayumi K. Shintani
ASSISTANT PROFESSORS Qingxia (Cindy) Chen, Xi (Steven) Chen, Leena Choi, Robert Greevy, Tatsuki Koyama, Chun Li, Ming Li, Benjamin Saville, Jonathan S. Schildcrout, Bryan Shepherd, Chris Slaughter, Lily Wang, Lei Xu, Chang Yu
INSTRUCTOR Fei Ye

Presently the Department of Biostatistics is not offering any degrees. The department is developing a master's and Ph.D. graduate program, with tentative plans to open in the fall semester of 2011. Inquiries about the status of the graduate program should be sent to the director of graduate studies.

Course descriptions begin on page 79.

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 two required courses in Cancer Biology (340 and 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 regular meetings, initially with a mentoring committee and then biannual meetings with a dissertation committee formed after passing the qualifying exam; a weekly Cancer Biology "Science Hour," starting in the spring of the third year of study; 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 degredation, 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.

Course descriptions begin on page 79.

Cell and Developmental Biology

INTERIM CHAIR William P. Tansey
DIRECTOR OF GRADUATE STUDIES Kathleen L. Gould
PROFESSORS Vivien A. Casagrande, Arthur F. Dalley II, Chin Chiang, Kathleen L. Gould, Steven Hanks, Stephen R. Hann, David M. Miller III, Jeanette Norden, William P. Tansey, Susan R. Wente, Christopher V. E. Wright
ASSOCIATE PROFESSORS Guoqiang Gu, Patricia Labosky
ASSISTANT PROFESSORS Stacey Huppert, Irina N. Kaverina, Ethan Lee, Laura Lee, Melanie Ohi, Ryoma Ohi, Andrea Page-McCaw, Matthew J. Tyska

DEGREE OFFERED: *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. 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 derive mechanistic understanding of developmental and cellular functions. The program is designed to lead to the Ph.D. degree; however, M.S. degrees are granted under special circumstances.

Course descriptions begin on page 80.

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, Cheryl M. Coffin, Jeffrey Mark Davidson, Sergio Fazio, Agnes B. Fogo, David Gailani, David R. Head, Richard L. Hoover, Billy G. Hudson, Michael Laposata, Barbara O. Meyrick-Clarry, William M. Mitchell, Harold L. Moses, Kevin G. Osteen, Fritz F. Parl, Samuel A. Santoro, Virginia L. Shepherd, Larry L. Swift, M. Kay Washington, Mary M. Zutter
ASSOCIATE PROFESSORS Sarki A. Abdulkadir, Christine M. Eischen, Walter G. Jerome III, Gregory C. Sephel, Yi-Wei Tang, William M. Valentine, Jeanne M. Wallace
ASSISTANT PROFESSORS Ty W. Abel, Dorin-Bogdan Borza, Kelli L. Boyd, James D. Chappell, Annette S. Kim, Amy S. Major, Claudio A. Mosse, Adam Seegmiller, 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.

Course descriptions begin on page 82.

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, Sandra J. Rosenthal
ASSOCIATE PROFESSORS Kenneth A. Debelak, G. Kane Jennings, Clare McCabe, Bridget R. Rogers
ASSOCIATE PROFESSOR OF THE PRACTICE Julie Ervin Sharp
ASSISTANT PROFESSORS Scott A. Guelcher, Jamey D. Young

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

CHEMICAL engineers play key roles in the development and production of commodity chemicals, pharmaceuticals and bioengineered materials, high-strength composites and specialty polymers, semiconductors and microelectronic devices, and a wide range of ultrapure fine chemicals. Indeed, chemical and biomolecular engineering is essential for the operation of contemporary society. The solutions to many of the problems that we face 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 engineering is and what chemical engineers do. Formal course work essentially increases 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 adsorption and surface chemistry, alternative energy and electrochemical engineering, biomaterials and tissue engineering, materials and nanotechnology, molecular and mathematical (or process) modeling, energy and the environment.

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 24 of these hours are course work including 12 hours in required chemical and biomolecular engineering courses. Of the remaining 12 hours at least 3 hours must be taken outside the department (and cannot be for a co-listed course). 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.

Course descriptions begin on page 83.

Chemical and Physical Biology

Admissions Program for Chemical and Physical Biology

The Chemical and Physical Biology program is an interdepartmental 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 imaging sciences, in structural biology, or in molecular biophysics. 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,

in vivo imaging, 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 four 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, the MSTP, 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.

Course descriptions begin on page 83.

Chemistry

CHAIR Michael P. Stone
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, David L. Tuleen, David J. Wilson
PROFESSORS Richard N. Armstrong, Darryl J. Bornhop, H. Alex Brown, Richard M. Caprioli, Walter J. Chazin, Stephen W. Fesik, 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
ASSOCIATE PROFESSORS David E. Cliffel, Piotr Kaszynski, Craig W. Lindsley, David W. Wright
ASSISTANT PROFESSORS Brian O. Bachmann, Eva M. Harth, John A. McLean, Jens Meiler
RESEARCH ASSISTANT PROFESSORS Anthony P. Gies, Hye-Young Kim, Kwangho Kim, Ashwath Jayagopal, Dmitry Koktysh, Ivan D. Kozekov, James R. McBride, Donald F. Stec, Keri A. Tallman, Ian D. Tomlinson, Markus W. Voehler, Alex G. Waterson, Huiyong Yin

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

RESEARCH programs are offered in analytical, biological, inorganic, organic, and physical chemistry along with interdisciplinary research programs in chemical biology, molecular toxicology, materials chemistry, nanoscale science, structural and computational biology, and chemical physics. A wide range of research is supported by excellent research facilities, modern instrumentation, and external funding.

A research thesis is required for the master's degree. Specific requirements for the Ph.D. degree are defined in the 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.

Course descriptions begin on page 84.

Chinese

CHINESE LANGUAGE PROGRAM COORDINATOR AND 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. Courses are not designed for advanced native speakers.

Course descriptions begin on page 85.

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
PROFESSORS OF THE PRACTICE James H. Clarke, Sanjiv Gokhale
ADJUNCT PROFESSORS Curtis D. Byers, Gregory L. Cashion, Vic L. McConnell
ASSOCIATE PROFESSORS Alan R. Bowers, Eugene J. LeBoeuf, Florence Sanchez, Robert E. Stammer Jr.
ASSOCIATE PROFESSORS OF THE PRACTICE Lori Troxel, John R. Veillette
RESEARCH ASSOCIATE PROFESSOR Andrew C. Garrabrants
ASSISTANT PROFESSORS Mark P. McDonald, Caglar Oskay
RESEARCH ASSISTANT PROFESSORS Edsel Daniel, James R. Dobbins

DEGREES OFFERED: *Master of Engineering, 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.

Course descriptions begin on page 85.

Classical Studies

CHAIR Barbara Tsakirgis
DIRECTOR OF GRADUATE STUDIES Joseph L. Rife
PROFESSORS EMERITI Robert Drews, F. Carter Philips, Susan Ford Wiltshire
PROFESSORS Thomas A. J. McGinn, Jack M. Sasson
ASSOCIATE PROFESSORS Kathy L. Gaca, Joseph L. Rife, Betsey A. Robinson, Barbara Tsakirgis
ASSISTANT PROFESSORS Elizabeth Jelinek, Michael Johnson, Mireille Lee, David Petrain, Bronwen Wickkiser
SENIOR LECTURER Daniel Solomon

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.

On entering, every student takes diagnostic examinations in Greek and Latin prose and poetry. The examinations are not graded and are intended only to determine 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 all classics M.A. students will take both graduate seminars regularly offered in Greek and Latin each semester and that they will strive to produce first-rate master's seminar papers in these graduate courses. When their papers attain an *A+* level of excellence, they are encouraged to present their papers to the Classics faculty and to submit their papers to professional academic conferences, such as the American Philological Association (APA), the Archaeological Institute of America (AIA), and the Classical Association of the Middle West and South (CAMWS). 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.

Classics M.A. students may fulfill their Greek and Roman art history requirement in several possible ways, including: (1) undergraduate courses in Greek or Roman art history, (2) graduate seminars in Greek or Roman art and archaeology, or (3) summer participation in the ASCSA or AAR for Greece or Rome, respectively. To fulfill the requirements for history, M.A. students should either (1) take two courses, one in each area (Greek history: CLAS 208 or 209; and Roman history: CLAS 212 or 213), or (2) take an 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.

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) in the hope of being accepted into one of these two summer programs. They also generally receive Rankin Fellowship funding from the department to support this study abroad in either the AAR or ASCSA summer program.

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 Greek, Latin, or Classics 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.

Course descriptions begin on page 87 for Classics, on page 104 for Greek, and on page 113 for Latin.

Community Research and Action

CHAIR Marybeth Shinn
DIRECTOR OF GRADUATE STUDIES Paul Dokecki
PROFESSOR EMERITUS John Newbrough
PROFESSORS Sandra Barnes, Leonard Bickman, Paul Dokecki, Craig Anne Heflinger, Carolyn Hughes, Velma Murry, Susan Saegert, Marybeth Shinn, William Turner, Kenneth Wallston
PROFESSOR OF THE PRACTICE Vera Stevens Chatman
RESEARCH PROFESSOR Mark Lipsey
ASSOCIATE PROFESSORS Tony Brown, Joseph Cunningham, James Fraser, Robert Innes, Torin Monahan, Maury Nation, Douglas Perkins, Paul Speer
ASSISTANT PROFESSOR Kimberly Bess
AFFILIATED FACULTY Brian Heuser, Stephen Heyneman

DEGREE OFFERED: *Doctor of Philosophy*

THE graduate program in community research and action is an interdisciplinary program combining community psychology, urban sociology, human geography, and community development. It trains action-researchers committed to promoting social justice in rigorous theoretical analysis and research methods to prepare them for careers in academia, research, and public policy. The Ph.D. degree includes (a) a core set of courses covering community psychology, community development, ethics, inequality, diversity and social justice, 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 other departments and specializations within Peabody College (e.g., leadership and organizations, quantitative psychology) and departments and schools throughout the university (e.g., economics, sociology, divinity, nursing). 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.

Course descriptions begin on page 88.

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., Stephen R. Schach
PROFESSORS Gautam Biswas, Benoit Dawant, Lawrence W. Dowdy, J. Michael Fitzpatrick, Gabor Karsai, Douglas C. Schmidt, Janos Sztipanovits
ASSOCIATE PROFESSORS Robert E. Bodenheimer, Douglas H. Fisher, Aniruddha S. Gokhale, Xenofon D. Koutsoukos, Akos Ledeczi, Jeremy P. Spinrad
ASSOCIATE PROFESSORS OF THE PRACTICE Matthew Jett Hall, Gerald H. Roth
ASSISTANT PROFESSORS Julie A. Adams, Yi Cui, 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.

Course descriptions begin on page 89.

Creative Writing

See English

Earth and Environmental Sciences

CHAIR David J. Furbish
DIRECTOR OF GRADUATE STUDIES Calvin F. Miller
PROFESSORS EMERITI Leonard P. Alberstadt, Arthur L. Reesman, William G. Siesser, Richard G. Stearns
PROFESSORS John C. Ayers, James H. Clarke, David J. Furbish, George M. Hornberger, David S. Kosson, Calvin F. Miller, Molly Fritz Miller
ASSOCIATE PROFESSORS Jonathan M. Gilligan, Steven L. Goodbred
ASSISTANT PROFESSORS Larisa R. G. DeSantis, Guilherme Gualda
SENIOR LECTURER Daniel J. Morgan
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.

Course descriptions begin on page 91.

Economics

CHAIR Tong Li
VICE CHAIR John A. Weymark
DIRECTOR OF GRADUATE STUDIES William J. Collins
DIRECTOR OF THE GRADUATE PROGRAM IN ECONOMIC DEVELOPMENT Kamal Saggi
PROFESSORS EMERITI T. Al Finegan, C. Elton Hinshaw, Cliff J. Huang, Clifford S. Russell, Gian Sabota, John J. Siegfried, Anthony M. Tang, Fred Westfield
PROFESSORS Kathryn H. Anderson, Jeremy Atack, Eric Bond, William J. Collins, John Conley, William W. Damon, Andrew F. Daughety, Robert A. Driskill, Benjamin Eden, Yanqin Fan, Gregory Huffman, Suhas Ketkar, Tong Li, Andrea Maneschi, Jennifer F. Reinganum, Peter L. Rousseau, Kamal Saggi, Quan Wen, John A. Weymark, Myrna Wooders
ASSOCIATE PROFESSORS Mario Crucini, Malcolm Getz, Kevin X. D. Huang, Andrea Moro, Mototsugu Shintani, George H. Sweeney
ASSISTANT PROFESSORS Christopher Bennett, Claudia Rei, Joel Rodrigue, Diana N. Weymark, Benjamin Zissimos

DEGREE OFFERED: *Doctor of Philosophy*

GRADUATE study in economics at Vanderbilt prepares students for research and teaching careers in universities and for leadership positions in government, international agencies, and business. The curriculum emphasizes economic theory, econometrics, and the use of theory and measurement in understanding economic phenomena and policy issues. 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 required courses in microeconomics and macroeconomics, economic history or history of economic thought, statistics, and econometrics. Economics courses in this catalog numbered below 250 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 oral 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.

At a minimum, it is expected that each entering student has 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

The GPED is intended primarily for students seeking a master's degree in economics with an interest in international development. Students who meet the academic requirements of 30 hours of course work, with at least a *B* average, receive the Master of Arts degree in economics. Students typically complete the program in sixteen to twenty-four months. Prospective students with a strong undergraduate background in economics, a good command of English, and high quantitative scores on the GRE are encouraged to apply. The program is described under Special Programs.

Course descriptions begin on page 92.

Electrical Engineering

CHAIR Daniel M. Fleetwood
ASSOCIATE CHAIR A. B. Bonds
DIRECTOR OF GRADUATE STUDIES Bharat L. Bhuva
PROFESSORS EMERITI Arthur J. Brodersen, James A. Cadzow, George E. Cook, Jimmy L. Davidson, Robert W. House, L. Ensign Johnson, Robert T. Nash, Richard G. Shiavi, Francis M. Wells, Edward J. White
PROFESSORS Bharat L. Bhuva, A. B. Bonds, Benoit M. Dawant, J. Michael Fitzpatrick, Daniel M. Fleetwood, Kenneth F. Galloway, Dennis G. Hall, Weng Poo Kang, Gábor Karsai, Kazuhiko Kawamura, Lloyd W. Massengill, Ronald D. Schrimpf, Janos Sztipanovits, Robert A. Weller
ASSOCIATE PROFESSORS Xenofon Koutsoukos, Akos Ledeczi, Richard Alan Peters II, Robert A. Reed, William H. Robinson, Greg Walker, D. Mitchell Wilkes, James E. Wittig
RESEARCH ASSOCIATE PROFESSORS Michael L. Alles, Theodore Bapty, Jeffrey D. Black, W. Timothy Holman, Marcus H. Mendenhall, Arthur F. Witulski
ASSISTANT PROFESSORS Zhaohua Ding, Bennett Landman, Sharon M. Weiss, Yaqiong Xu
RESEARCH ASSISTANT PROFESSOR Sandeep Neema

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 website. 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.

Course descriptions begin on page 94.

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.

Course descriptions begin on page 96.

English

CHAIR Mark Schoenfield
DIRECTOR OF GRADUATE STUDIES Dana Nelson
DIRECTOR OF CREATIVE WRITING PROGRAM Mark Jarman
PROFESSORS EMERITI Paul Elledge, John Halperin, R. Chris Hassel Jr., Harold Lerow Weatherby Jr.
PROFESSORS Houston Baker, Robert Barsky, Vereen M. Bell, Jay Clayton, Colin (Joan) Dayan, Carolyn Dever, Tony Earley, 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, Mark Schoenfield, Hortense Spillers, Cecelia Tichi, Mark A. Wollaeger
ASSOCIATE PROFESSORS Kate Daniels, Teresa A. Goddu, Lorraine Lopez, Ifeoma Nwankwo, Bridget Orr, Nancy Reisman, Kathryn Schwarz, Paul Young
ASSISTANT PROFESSORS Beth Bachmann, Humberto Garcia, Rick Hilles, Ellen Levy, Dahlia Porter, Allison Schachter, Rachel Teukolsky
VISITING ASSISTANT PROFESSOR Cristina Pangilinan
WRITERS IN RESIDENCE Peter Guralnick, Sandy Solomon
POSTDOCTORAL FELLOW Gabriel Cervantes

DEGREES OFFERED: *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.

Course descriptions begin on page 97.

Environmental Engineering

CHAIR David S. Kosson
DIRECTOR OF GRADUATE STUDIES James H. Clarke
PROFESSORS EMERITI W. Wesley Eckenfelder, John A. Roth, Karl B. Schnelle Jr., Richard E. Speece, Edward L. Thackston
PROFESSORS Mark D. Abkowitz, P. K. Basu, David J. Furbish, George M. Hornberger, David S. Kosson, Sankaran Mahadevan, Frank L. Parker, Charles W. Powers
PROFESSORS OF THE PRACTICE James H. Clarke, Sanjiv Gokhale
ADJUNCT PROFESSORS Curtis D. Byers, Gregory L. Cashion, Ann N. Clarke, B. John Garrick, Vic L. McConnell, Michael T. Ryan, Raymond G. Wymer
ASSOCIATE PROFESSORS John C. Ayers, Alan R. Bowers, Steven L. Goodbred, Eugene J. LeBoeuf, Florence Sanchez, Michael G. Stabin
RESEARCH ASSOCIATE PROFESSOR Andrew C. Garrabrants
ASSISTANT PROFESSORS Mark P. McDonald, Caglar Oskay
RESEARCH ASSISTANT PROFESSORS Edsel B. Daniel, James P. Dobbins

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

THE graduate program in environmental engineering provides options for study and research in environmental engineering, environmental science, and environmental policy and management. Students pursuing advanced degrees focus their course work and research in nuclear environmental engineering, water quality and resources, waste management and remediation, energy choices and environmental consequences, or environmental resources and geologic processes.

The master of engineering degree, offered through the School of Engineering, requires 30 hours of course work and a project report.

The master of science degree may be earned through (a) 24 hours of course work and a thesis or (b) a non-thesis program requiring 30 hours of course work.

The Ph.D. degree requires a minimum of 36 hours of course work plus a dissertation. In addition, all Ph.D. students must pass a comprehensive exam based on their course work and area of interest as well as the university-required qualifying exam.

Course descriptions begin on page 97.

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; energy use; climate change; waste management; and global environmental issues.

Participating faculty include Mark Abkowitz (Civil and Environmental Engineering), James Clarke (Civil and Environmental Engineering), David Furbish (Earth and Environmental Sciences), George Hornberger (Civil and Environmental Engineering), David Kosson (Civil and Environmental Engineering), David Owens (Management), Frank Parker (Civil and Environmental Engineering), James Schorr (Management), Michael Stabin (Radiology and Radiological Sciences), and Michael Vandenbergh (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 website at *www.vanderbilt.edu/VCEMS*.

Epidemiology

DIRECTOR OF GRADUATE STUDIES Katherine E. Hartmann
PROFESSORS William Blot, Peter Buerhaus, William Cooper, Robert Dittus, Wes Ely, Marie Griffin, Jonathan Haines, Joseph McLaughlin, Wayne Ray, Maureen Sanderson, Xiao-ou Shu, Sten Vermund, Wei Zheng
ASSOCIATE PROFESSORS Qiuyin Cai, Tom Elasy, Debra Friedman, Russell Rothman, Flora Ukoli, Scott Williams
RESEARCH ASSOCIATE PROFESSOR Wanqing Wen
ASSISTANT PROFESSORS Liana Castel, Qi Dai, Sandra Deming, Todd Edwards, Meira Epplein, Jay Fowke, Asha Kallianpur, Jirong Long, Melissa McPheeters, Harvey Murff, Han-Zhu Qian, Marylyn Ritchie, Martha Shrubsole, Jonathan Schildcrout, Lisa Signorello, Digna Velez-Edwards, Raquel Villegas, Xianglan Zhang
RESEARCH ASSISTANT PROFESSOR Gong Yang
RESEARCH INSTRUCTORS Hui Cai, Aaron Kipp

DEGREE OFFERED: *Doctor of Philosophy*

THE unique focus of the Ph.D. program in epidemiology is training epidemiologists with unparalleled excellence in advanced quantitative methods who have a strong grasp of causal logic, inference, probability, and other theoretical aspects of study design and data analysis, in addition to content area expertise. The curriculum features classroom, computing, and experience-based teaching. The program integrates training and research across clinical, laboratory, and quantitative disciplines. At the completion of the program, graduates will be prepared to develop an independent research portfolio in academia, research, or industry. Our goal is to train critical thinkers prepared to make fundamental advances using rigorous and cutting-edge approaches to research. Graduates will be able to contribute across a wide spectrum of content areas and research foci.

Students admitted to the program are required to complete a total of 72 credit hours, including course work and research. Selected core courses will be shared with the biostatistics graduate programs. In addition to the required methods curriculum, students will take content area and advanced methods electives. Students are eligible to take relevant course work, for which they meet the prerequisites, in any Vanderbilt department. Requirements for program completion include a comprehensive examination at the end of the second year, an oral defense of the dissertation proposal, and the doctoral dissertation. The program is expected to take four years to complete. Students can accelerate their studies to complete the program in three years.

Students will be matched shortly after acceptance with

research preceptor teams. These established multidisciplinary teams include epidemiology faculty, clinical experts and clinical researchers, biostatisticians, and experienced research staff. The research preceptor team commits to involving the student as a co-investigator from the beginning of the student's graduate studies. Students will use actual data from their research teams in their course work. The goal is to create a mutually beneficial partnership that produces synergy between education, professional development, and the conduct of research.

Strong candidates for admission will have a master's degree in epidemiology, biostatistics, or another quantitative discipline; experience in the conduct of research and independent data analysis; and strong quantitative preparation and aptitude, including high GRE scores. Top applicants will have an expenses-paid, on-campus interview during which they will meet with research teams. Both students and research teams will then have the opportunity to rank whom they feel would be the best match(es).

For further information, please visit our website at *www.epi.phd.vanderbilt.edu.*

Course descriptions begin on page 100.

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, William Franke, Marc Froment-Meurice, Virginia M. Scott, Tracy Sharpley-Whiting
ASSOCIATE PROFESSORS Nathalie Debrauwere-Miller, Anthère Nzabatsinda, Lynn Ramey, Holly A. Tucker
ASSISTANT PROFESSORS Jérôme Brillaud, Paul Miller, Andrea Mirabile

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 French 302 or French 318.

In addition to French and English, doctoral candidates must demonstrate a reading knowledge of a foreign language appropriate to the area of specialization. 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).

Course descriptions begin on page 102 for French and on page 113 for Italian.

Gender Studies

See Women's and Gender Studies

Germanic and Slavic Languages

CHAIR Dieter H. Sevin
DIRECTOR OF GRADUATE STUDIES Meike G. Werner
PROFESSORS EMERITI David A. Lowe, Helmut Pfanner, Richard N. Porter
PROFESSORS Barbara Hahn, John A. McCarthy, Dieter H. Sevin
MAX KADE DISTINGUISHED VISITING PROFESSOR Barbara Wahlster (Spring 2011)
ASSOCIATE PROFESSORS Konstantin V. Kustanovich, Meike G. Werner
MELLON ASSISTANT PROFESSOR Irina Makoveeva
ASSISTANT PROFESSORS James McFarland, Margaret Setje-Eilers, Christoph Zeller
LECTURER David Matthew Johnson
FEODOR LYNEN FELLOW Thomas Wild

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

GRADUATE studies in German at Vanderbilt 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 Vanderbilt. 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.

Course descriptions begin on page 102 for German and on page 162 for Russian.

Hearing and Speech Sciences

CHAIR Anne Marie Tharpe
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, Lee Ann Golper, D. Wesley Grantham, Linda J. Hood, Gary P. Jacobson, Howard S. Kirshner, Gus Mueller, Ralph N. Ohde, Robert H. Ossoff, Anne Marie Tharpe, Mark T. Wallace
CLINICAL PROFESSOR Gary A. Duncan
ASSOCIATE PROFESSORS Gene W. Bratt, Troy Hackett, P. Lynn Hayes, Ellen Kelly, Todd A. Ricketts, Sandra Schneider, Mark Wallace
ASSISTANT PROFESSORS Patricia F. Allen, Tamala Bradham, Mary N. Camarata, Michael de Riesthal, William Dickinson, Lea Helen Evans, Mary Sue Fino-Szumski, Michelle L. Gutmann, Sue Hale, Charles Hausman, Melissa Henry, Benjamin W. Y. Hornsby, Devin McCaslin, C. Melanie Schuele, Marcy Sipes, Wanda G. Webb
RESEARCH ASSISTANT PROFESSOR Alexandra Key
ADJUNCT ASSISTANT PROFESSORS John R. Ashford, Barbara Peek, Amy M. Robbins, Mia Rosenfeld

DEGREE OFFERED: *Doctor of Philosophy*

THE Ph.D. degree normally requires three to four 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.D.E.), 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 *www.vanderbiltbillwilkersoncenter.com.*

Course descriptions begin on page 104.

History

CHAIR Elizabeth Lunbeck
ACTING CHAIR James A. Epstein
DIRECTOR OF GRADUATE STUDIES Matthew Ramsey
PROFESSORS EMERITI Paul K. Conkin, Charles F. Delzell, Jimmie L. Franklin, J. León Helguera, Samuel T. McSeveney, V. Jacque Voegeli, Donald L. Winters
PROFESSORS Jeremy Atack, Michael D. Bess, Richard J. M. Blackett, William Caferro,William J. Collins, Katherine B. Crawford, Dennis C. Dickerson, Marshall C. Eakin, James A. Epstein, Gary Gerstle, Joel F. Harrington, Jane Gilmer Landers, Peter Lake, Elizabeth Lunbeck, Thomas Alan Schwartz, Helmut W. Smith, Arleen M. Tuchman, Daniel H. Usner Jr., David Wasserstein
ASSOCIATE PROFESSORS David Lee Carlton, Gerald Figal, Leor Halevi, Yoshikuni Igarashi, Sarah Igo, Paul A. Kramer, Matthew Ramsey, Ruth Rogaski, Francis W. Wcislo
ASSISTANT PROFESSORS Brandi Brimmer, Celso T. Castilho, Lauren Clay, Julia Phillips Cohen, Peter James Hudson, Catherine Molineux, Ole Molvig, Moses Ochonu, Frank Robinson, Samira Sheikh, Edward Wright-Rios

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

A THESIS is required for the master's degree in history. All students must achieve reading competency in at least one foreign language.

The Ph.D. degree program in history includes at least 45 hours of formal course work. A reading knowledge of at least one foreign language is required. Students must demonstrate reading knowledge of appropriate 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.

Course descriptions begin on page 107.

History of Art

CHAIR Vivien Green Fryd
DIRECTOR OF GRADUATE STUDIES Betsey A. Robinson
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 A. Robinson, Barbara Tsakirgis
ASSISTANT PROFESSORS James J. Bloom, Jinah Kim, Mireille M. Lee, Elizabeth J. Moodey

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 in the process of reconfiguring the graduate program to better meet the needs of the growing professionalism in the discipline. We are not currently accepting applications for graduate study, but will once a new program is in place.

Course descriptions begin on page 110.

Human Genetics

DIRECTOR Jonathan L. Haines
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, Carl Johnson, MacRae Linton, David McCauley, Louis Muglia, James Patton, John A. Phillips III, Dan Roden, Scott M. Williams, Laurence J. Zwiebel
ASSOCIATE PROFESSORS Ela Knapik, Marylyn D. Ritchie, David Samuels, Jeffrey Smith, Michelle Southard-Smith, James S. Sutcliffe, Zhongming Zhao
ASSISTANT PROFESSORS William Bush, Dana Crawford, Katherine Friedman, Rizwan Hamid, Jennifer Kearney, Chun Li, Thomas Morgan, Douglas Mortlock, Deborah Murdock, Antonis Rokas, Shirley Russell, Tricia Thornton-Wells
RESEARCH INSTRUCTOR Kylee Spencer

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.

Course descriptions begin on page 110.

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, Sokrates 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. Cliffel, Frederick R. Haselton, G. Kane Jennings, Piotr Kaszynski, Deyu Li, Clare McCabe, Bridget R. Rogers, Florence Sanchez, Greg Walker, James E. Wittig, David W. Wright
RESEARCH ASSOCIATE PROFESSORS A. V. Anilkumar, Anthony Hmelo
ASSISTANT PROFESSORS James Dickerson, Eva Harth, 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.

Course descriptions begin on page 111.

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.

Course descriptions begin on page 113.

Japanese

JAPANESE LANGUAGE PROGRAM COORDINATOR AND SENIOR LECTURER Keiko Nakajima

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. Courses are not designed for advanced native speakers.

Course descriptions begin on page 113.

Jewish Studies

See Religion

Latin American Studies

DIRECTOR Edward F. Fischer
ASSOCIATE DIRECTORS W. Frank Robinson, Helena Simonett
DIRECTOR OF GRADUATE STUDIES W. Frank Robinson
ASSISTANT PROFESSOR Helena Simonett
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 (Portuguese), Leonard Folgarait (History of Art), Edward H. Friedman (Spanish), Lesley Gill (Anthropology), Thomas A. Gregor (Anthropology), Cathy L. Jrade (Spanish), Jane G. Landers (History), William Luis (Spanish), Andrea Maneschi (Economics), René Prieto (Spanish), Philip D. Rasico (Spanish), Mitchell A. Seligson (Political Science), David Wasserstein (History)
ASSOCIATE PROFESSORS M. Frăncille Bergquist (Spanish), Susan Berk-Seligson (Spanish), Victoria Burrus (Spanish), Beth A. Conklin (Anthropology), William R. Fowler Jr. (Anthropology), James Fraser (Human and Organizational Development), Jonathan Hiskey (Political Science), John Janusek (Anthropology), Carlos Jáuregui (Spanish), Christina Karageorgou (Spanish), Emanuelle Oliveira (Spanish), Norbert O. Ross (Anthropology), Mariano Sana (Sociology), Benigno Trigo (Spanish and Portuguese), Andrés Zamora (Spanish and Portuguese), Elizabeth J. Zechmeister (Political Science)
ASSISTANT PROFESSORS Markus Eberl (Anthropology), Efrén O. Pérez (Political Science), W. Frank Robinson (History), Sergio Romero (Anthropology), Miriam Shakow (Anthropology), Helena Simonett (Blair, Latin American Studies), Tiffiny A. Tung (Anthropology), Steven Wernke (Anthropology), Edward Wright-Rios (History)
SENIOR LECTURER: Marcio Bahia (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.

Course descriptions begin on page 114.

See departmental listings for courses offered 2010/2011. 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 Language 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.

HISTORY OF ART. 234, Twentieth-Century Mexican Literature, Film, and Art; 256, Art of the Maya; 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: 277, Contemporary Latin America; 279, Contemporary Mexican Society; 390a–390b, Directed Studies.

SPANISH: 210, Spanish for the Legal Profession; 211, Spanish for the Medical Profession; 213, Translation and Interpretation; 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; 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; 243, Latino Immigration Experience; 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; 283, Spanish in Society; 285, Discourse Analysis; 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 Kathryn H. Anderson
PROFESSORS Kathryn H. Anderson, Joni Hersch, W. Kip Viscusi
ASSISTANT PROFESSOR Paige Marta Skiba

Affiliated Faculty
PROFESSORS Andrew F. Daughety, Jennifer F. Reinganum

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. The program is designed to allow students to satisfy the requirements for the Ph.D. within four to five years. For students who matriculate without a J.D., the requirements for the Ph.D. and the J.D. degrees can be completed within six to seven years. 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 47 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 (email *phd.lawecon@vanderbilt.edu*) or from the program webpage, *law.vanderbilt.edu/go/phdlawecon*.

Course descriptions begin on page 114.

Leadership and Policy Studies

CHAIR Ellen B. Goldring
DIRECTOR OF GRADUATE STUDIES Thomas M. Smith
PROFESSOR EMERITUS James W. Guthrie
PROFESSORS John M. Braxton, Robert L. Crowson Jr., Ellen B. Goldring, Stephen P. Heyneman, Joseph Murphy
PROFESSOR OF THE PRACTICE Janet S. Eyler
ASSOCIATE PROFESSORS Robert Dale Ballou, Mark D. Cannon, Constance Bumgarner Gee, Michael K. McLendon, Thomas M. Smith, Claire E. Smrekar, Ron Zimmer
ASSISTANT PROFESSORS William Doyle, Mimi Engel, Stella Flores, Christopher Loss
ASSISTANT PROFESSORS OF THE PRACTICE Xiu Cravens, Brian L. Heuser, Catherine Gavin Loss, Dayle A. Savage
RESEARCH ASSISTANT PROFESSOR Matthew Springer

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 a research 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. At the heart of the program is the mentor-apprentice model, where students work on research projects alongside a collection of esteemed faculty. 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. 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 a research position 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 International Ed. Policy

II. Ph.D. Policy Analysis Seminars (ELP–9 hours; HELP–15 hours)

Rotating Topics

III. Research Tools (18 hours)

Research Design and Methods
Intro to Statistics
Regression Analysis I
Qualitative Research Methods
Research Methods Elective I
Research Methods Elective II

IV. Research Practicum (6 hours)

V. Electives (21–27 hours)

Course descriptions begin on page 115.

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 Lehrer, Victoria J. Risko, Leona Schauble
PROFESSOR OF THE PRACTICE EMERITA Earline D. Kendall
PROFESSOR OF THE PRACTICE Marcy Singer-Gabella
ASSOCIATE PROFESSORS Douglas Clark, Clifford A. Hofwolt, Ilana Horn, 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, Pratim Sengupta
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

DEGREE OFFERED: *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.

Course descriptions begin on page 117.

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 website for additional information: *www.vanderbilt.edu/mlas.*

Course descriptions begin on page 120.

Management

DEAN James Bradford
DIRECTOR OF THE PH.D. PROGRAM Clifford A. Ball
PROFESSORS EMERITI J. Dewey Daane, Richard L. Oliver, David L. Rados, H. Martin Weingartner
PROFESSORS Clifford A. Ball, Bruce Barry, Joseph D. Blackburn Jr., Robert Blanning, Germain B. Böer, Nicolas Bollen, Paul K. Chaney, William G. Christie, Mark A. Cohen, Bruce Cooil, Richard L. Daft, Raymond A. Friedman, Dawn Iacobucci, Larry J. LeBlanc, Craig M. Lewis, Salvatore T. March, Ronald W. Masulis, David C. Parsley, Steven Posavac, Gary D. Scudder, Hans R. Stoll, Bart Victor, Robert Whaley

CLINICAL PROFESSORS James Bradford, Michael Burcham, Tim DuBois, William I. Henderson, Jon Lehman, Neta Moye, David Owens, Jim Schorr, Frederick Talbott
ASSOCIATE PROFESSORS Jennifer Escalas, Luke M. Froeb, Tim Gardner, Karl Hackenbrack, Steven Hoeffler, Nancy Lea Hyer, Nicole Jenkins, Debra C. Jeter, Michael Lapré, Rangaraj Ramanujam, Jacob Sagi, Larry Van Horn, Richard Willis
ASSISTANT PROFESSORS Jeff Dotson, Mumin Kurtulus, Alexei Ovtchinnikov, Miguel Palacios, Mark Ratchford, 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.

Course descriptions begin on page 101 for Financial Economics and on page 121 for Management.

Materials Science and Engineering

See Interdisciplinary Materials Science

Mathematics

CHAIR Dietmar Bisch
VICE CHAIR John G. Ratcliffe
DIRECTOR OF GRADUATE STUDIES Mike Neamtu
DIRECTOR OF TEACHING John Rafter
PROFESSORS EMERITI Richard F. Arenstorf, Billy F. Bryant, Richard R. Goldberg, Matthew Gould, Robert L. Hemminger, Ettore F. Infante, Bjarni Jónsson, Charles S. Kahane, Richard J. Larsen, Michael D. Plummer, 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, Mike Neamtu, Alexander Olshanskiy, 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
VISITING PROFESSOR Guillermo López Lagomasino
ADJOINT PROFESSORS Don Hong, Mary Ann Horn, Xiaoya Zha
ASSOCIATE PROFESSORS Denis Osin, Eric Schechter, Steven T. Tschantz
ASSISTANT PROFESSORS Simone Bova, Michael Brandenbursky, Richard Burstein, Michael Chance, Ionut Chifan, Juraj Foldes, Basak Gürel, Thomas Hangelbroek, Stacey Hoehn, Mehdi Lejmi, Jesse Peterson, Alexander Powell, Joanna Pressley, Mrinal Raghupathi, Rares Rasdeaconu, Ioana Suvaina, Jonathan Whitehouse, Rufus Willett, Ju-Yi Yen, Dongping Zhuang
RESEARCH ASSISTANT PROFESSOR Pinhas Grossman
VISITING ASSISTANT PROFESSOR Mathias Wilke
SENIOR LECTURER EMERITA Jo Ann W. Staples
SENIOR LECTURERS Derek Bruff, Linda Hutchison, Pamela Pigg, John Rafter, Lori Rafter
LECTURER Justin Fitzpatrick

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. 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 with a teaching assistantship participate in teaching activities.

Course descriptions begin on page 127.

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, Taylor G. Wang, James J. Wert, John W. Williamson
PROFESSORS Michael Goldfarb, Robert W. Pitz, Carol A. Rubin, Alvin M. Strauss
PROFESSOR OF THE PRACTICE Amrutur V. Anilkumar
RESEARCH PROFESSORS EMERITI J. Leith Potter, Robert A. Weeks
RESEARCH PROFESSOR Taylor Wang
ADJOINT PROFESSOR Andrew A. Wereszczak
ASSOCIATE PROFESSORS Eric J. Barth, Deyu Li, Nilanjan Sarkar, Nabil Simaan, Greg Walker
ASSOCIATE PROFESSOR OF THE PRACTICE Robert J. Barnett
ADJOINT ASSOCIATE PROFESSOR Joseph A. Wehrmeyer
ASSISTANT PROFESSORS Jon F. Edd, Haoxiang Luo, Jason G. Valentine, Robert J. Webster III
ADJOINT ASSISTANT PROFESSOR Peiyong Wang

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 12 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.

Course descriptions begin on page 130.

Medicine, Health, and Society

DIRECTOR Katharine M. Donato
ASSISTANT DIRECTOR Courtney Muse
SENIOR LECTURERS Juleigh Petty, Marian V. Yagel

Affiliated Faculty
PROFESSORS Kathryn Anderson (Economics), Michael Bess (History), 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), Katherine Crawford (History), Richard D'Aquila (Infectious Diseases), Carolyn Dever (English), Dennis Dickerson (History), Katharine Donato (Sociology), Volney Gay (Religious Studies), Lenn Goodman (Philosophy), Thomas Gregor (Anthropology), Douglas Heimburger (Medicine), Joni Hersch (Law and Economics), George Hill (Microbiology and Immunology), Carl Johnson (Biological Sciences), John Lachs (Philosophy), Jane Landers (History), Jana Lauderdale (Nursing), Pat Levitt (Pharmacology), Elizabeth Lunbeck (History), Leah Marcus (English), John McCarthy (German), Richard McCarty (Psychology), Timothy McNamara (Psychology), Linda Norman (Nursing), Charles Scott (Philosophy), Sharon Shields (Human and Organizational Development), John Tarpley (Surgery), Arleen Tuchman (History), R. Jay Turner (Sociology), 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 (Christian Ethics), Gregory Barz (Ethnomusicology), Jeffrey P. Bishop (Medicine), Tony N. Brown (Sociology), Karen Campbell (Sociology), Laura Carpenter (Sociology), André Christie-Mizell (Sociology), Beth Conklin (Anthropology), Kate Daniels (English), Joseph B. Fanning (Medicine), Elizabeth Heitman (Medicine), Kathleen Hoover-Dempsey (Psychology and Human Development), Lynda L. Lamontagne (Nursing), Melanie Lutenbacher (Nursing), 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), Tyson Brown (Sociology), Barbara Clinton (Nursing and Medicine), Carol Etherington (Nursing), Jill A. Fisher (Medicine), Rolanda Johnson (Nursing), Chase Lesane-Brown (Psychology and Human Development), Scott Pearson (Surgery), Michele Salisbury (Nursing), Lijun Song (Sociology), Tiffiny Tung (Anthropology), Timothy J. Vogus (Management and Organization Studies)
SENIOR LECTURER Russell M. McIntire Jr. (Philosophy)

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.

M.D./M.A.

This program is available to current medical students, who may choose between the thesis and non-thesis options described above. The M.A. may be completed in one year, plus either a summer or two research electives.

4+1 M.A. Program

This program is available only to current Vanderbilt undergraduate students majoring in MHS. Students may choose between the thesis and non-thesis options described above.

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.

Course descriptions begin on page 131.

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; 274, Health and Disease in Ancient Populations; 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); 355, English and American Literature (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; 256, Philosophy of Mind; 270, Ethics and Medicine; 335; Philosophy and Medicine I; 336, Philosophy and Medicine II.

PSYCHOLOGY: 215, Abnormal Psychology; 232, Mind and Brain; 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 Intergroup Relations; 268, Health Psychology; 277, Brain Damage and Cognition; 301a–301b, 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, Group 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, Terence S. Dermody, Jacek Hawiger, J. Harold Helderman, George C. Hill, Sebastian Joyce, Alexander R. Lawton, Theodore Pincus, Donald H. Rubin, H. Earl Ruley, Subramaniam Sriram, James Ward Thomas, Luc Van Kaer, Mary Zutter
ASSOCIATE PROFESSORS Thomas N. Aune, Joey V. Barnett, Timothy Cover, Mark R. Denison, David W. Haas, Spyros Kalams, Douglas Kernodle, Andrew J. Link, Geraldine G. Miller, Louise A. Rollins-Smith, Eric P. Skaar
ASSISTANT PROFESSORS Wonder Drake, D. Borden Lacy, Eric Sebzda, Ben Spiller, John Williams
RESEARCH ASSISTANT PROFESSORS Qing Lin, Yan Xue Liu, Danyvid Olivares-Villagómez, Maria Pia G. Pasquale, Lance Thomas, Lan Wu, Jing Zhou, Josef Zienkiewicz
RESEARCH INSTRUCTORS Kyra Oswald-Richter, Ruth Ann Veach

DEGREE OFFERED: *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, Joyce, Kernodle, 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, Ruley, Van Kaer);
- Bacterial pathogenesis, including mechanisms of toxin action (Cover, Drake, Hawiger, Lacy, Skaar, Spiller)
- Mechanism of action of bacterial toxins (Cover, Hawiger, Lacy, Skaar);
- Molecular genetics (Link, Ruley, Skaar);
- Functional genomics, structure, and proteomics (Hawiger, Lacy, Link, Ruley, Spiller, 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.

Course descriptions begin on page 132.

Molecular Physiology and Biophysics

CHAIR Roger D. Cone
DIRECTOR OF GRADUATE STUDIES Danny G. Winder
PROFESSORS Albert H. Beth, G. Roger Chalkley, Alan D. Cherrington, Roger J. Colbran, Roger D. Cone, Jackie D. Corbin, Eric Delpire, Emmanuele DiBenedetto, Ronald B. Emeson, John H. Exton, Aurelio Galli, John C. Gore, Jonathan L. Haines, Raymond Harris, Carl H. Johnson, Robert MacDonald, Mark A. Magnuson, James M. May, Hassane Mchaourab, Owen P. McGuinness, Louis Muglia, Richard M. O'Brien, Jane H. Park, David W. Piston, Alvin C. Powers, Roland W. Stein, Phoebe L. Stewart, David H. Wasserman, P. Anthony Weil, John P. Wikswo Jr., Scott Williams, Danny G. Winder
RESEARCH PROFESSORS Sharon H. Francis, K. Sam Wells
ASSOCIATE PROFESSORS Maureen Gannon, Volker H. Haase, Alyssa Hasty, Anne K. Kenworthy, Marylyn DeRiggi Ritchie, David Samuels, Linda Sealy, James S. Sutcliffe, Jeanne Wallace
RESEARCH ASSOCIATE PROFESSORS Charles E. Cobb, Eric Hustedt, Robert Matthews, Mary C. Moore, Jacques Pantel
ASSISTANT PROFESSORS Jeffrey Canter, Wenbiao Chen, Dana Crawford, Bruce Damon, Niels De Jonge, Kate Ellacott, David Jacobson, Douglas P. Mortlock, Kevin Niswender, Masakazu Shiota, John Stafford, Tricia Thornton-Wells, Jamey Young
RESEARCH ASSISTANT PROFESSORS Holli H. Dilks, Dale S. Edgerton, Subhadra Gunawardana, Hanane Koteiche, Michael McCaughey, Deborah Murdock, Patrick Page-McCaw, Richard L. Printz, Richard R. Whitesell
RESEARCH INSTRUCTORS Sheng-Song Chen, Kevin Erreger, Heinrich Matthies, Christopher Olsen, Anna Osipovich, Nathalie Schnetz-Boutaud, Kylee Spencer, Susanne Thomas, Saraswathi Viswanathan, Dwight Williams

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 pathophysiology, 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 in order to select a particular research 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 of biological process involving glucose, fatty acid and ion transport, as well as the mechanism of action of hormonal second messengers such as cAMP, cGMP, and calcium. 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, obesity, cancer, nutritional deficiencies, developmental abnormalities, and addiction.

Course descriptions begin on page 132.

Music

DEAN Mark Wait (Blair School of Music)
ASSOCIATE DEAN Cynthia J. Cyrus (Blair School of Music)
ASSOCIATE DEAN Pamela Schneller (Blair School of Music)
ASSISTANT DEAN Melissa K. Rose (Blair School of Music)
SENIOR ARTIST TEACHER Marianne Ploger (Musicianship)

THREE courses are currently available in Musicianship for graduate credit: MUSC 341A, Intensive Musicianship I; MUSC 341B, Intensive Musicianship II; MUSC 342, Intensive Musicianship III.

Course descriptions begin on page 134.

Neuroscience

DIRECTOR Mark Wallace
DIRECTOR OF GRADUATE STUDIES Douglas McMahon
PROFESSORS Michael Aschner, Malcolm Avison, Jeffrey R. Balser, Randolph Blake, Randy D. Blakely, Kendal Broadie, Bruce D. Carter, Vivien A. Casagrande, Chin Chiang, Roger Colbran, Roger Cone, Jeffrey Conn, Louis J. DeFelice, Eric Delpire, Ariel Y. Deutch, Elisabeth Dykens, Ford F. Ebner, Ronald B. Emeson, Aurelio Galli, Isabel Gauthier, 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, Bruce McCandliss, Robert L. Macdonald, Douglas McMahon, Timothy P. McNamara, Herbert Y. Meltzer, Karoly Mirnics, Louis Muglia, Terry Page, Sohee Park, John S. Penn, Elaine Sanders-Bush, Jeffrey D. Schall, Lilianna Solnica-Krezel, Subramaniam Sriram, Mark Wallace, Ronald G. Wiley, Laurence J. Zwiebel
ASSOCIATE PROFESSORS Adam Anderson, Jo-Anne Bachorowski, David Calkins, Kenneth C. Catania, Laurie Cutting, Troy Hackett, Darryl Hood, Jun Li, René Marois, David M. Miller III, Thomas J. Palmeri, Marilyn DeRiggi Ritchie, Anna Roe, Bih-Hwa Shieh, Michelle Southard-Smith, James S. Sutcliffe, Frank Tong, William M. Valentine, Brian E. Wadzinski, Danny G. Winder, David H. Zald, Zhongming Zhao
ASSISTANT PROFESSORS Jennifer Blackford, Aaron Bowman, Carissa Cascio, Li Min Chen, Michael Cooper, Ron Cowan, Kevin Currie, Kevin Ess, Martin Gallagher, Joshua Gamse, Eugenia Gurevich, Kevin Haas, Maureen Hahn, Peter Hedera, Jennifer Kearney, Greg Mathews, Bethann McLaughlin, Sachin Patel, Sean Polyn, Bernard Rousseau, Rebecca Sappington, Gregg Stanwood, Tricia A. Thornton-Wells, Jeremy Veenstra-VanderWeele, Donna Webb, Neil Woodard

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 scientist and teacher. Graduates are recruited for positions into academic institutions where the discipline of neuroscience is growing rapidly, as well as into government, industry, and biotechnology.

The Ph.D. program requires a minimum of 24 hours of formal course work. Two areas of focus (tracks) are available: Cellular & Molecular and Cognitive & Systems. Students in the Cellular & Molecular track participate in the IGP (see Biomedical Sciences), completing an interdisciplinary core of course work in their first year. Students in the Cognitive & Systems track enter immediately into the program. For both tracks, a required set of core modules includes three courses (Cellular and Molecular Neuroscience, Systems Neuroscience, and Cognitive Neuroscience), of which the student chooses two. These courses survey the broad areas of neuroscience and are designed to link fundamental principles to contemporary research. Neuroscience Discussions, a course focused on history and professional development, is also required during the first year. Additional requirements include courses in neuroanatomy and biostatistics. An individualized elective schedule augments the required material in areas that relate directly to the student's area of chosen research. Major research themes within the program span the breadth of contemporary neuroscience, and include perception, cognition, circadian rhythms, development, neurotransmission, plasticity, sensory processes, 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.*

Course descriptions begin on pages 134 and 135. For courses that have NSC 201 as a prerequisite, PSY 201 also satisfies that prerequisite if it was completed prior to fall 2008.

Nursing Science

DEAN Colleen Conway-Welch
PROFESSORS Susan M. Adams, Peter I. Buerhaus, Colleen Conway-Welch, Karen C. D'Apolito, Mary Jo Gilmer, Jeffry S. Gordon, Joan E. King, Larry E. Lancaster, Donna B. McArthur, Ann F. Minnick (Program Co-Director), Lorraine C. Mion, Linda D. Norman (Program Co-Director), James C. 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 L. Wells
ASSOCIATE PROFESSORS Sarah C. Fogel, Rolanda L. Johnson, Jana L. Lauderdale, Melanie Lutenbacher, Elizabeth R. Moore
RESEARCH ASSOCIATE PROFESSOR Mary S. Dietrich
ASSISTANT PROFESSORS Thomas L. Christenbery, Thomas H. Cook, Shelagh A. Mulvaney, Sheila H. Ridner, Michele S. Salisbury, Michael W. Vollman

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 website at *www.nursing.vanderbilt.edu/phd.*

Course descriptions begin on page 136.

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 Wolf D. Dettbarn, Joel G. Hardman, Jack N. Wells
PROFESSORS Michael Aschner, Malcolm Avison, Jeffrey Balser, Joey V. Barnett, Italo Biaggioni, Randy D. Blakely, Alan R. Brash, Kendal S. Broadie, H. Alex Brown, Nancy J. Brown, Richard Caprioli, Jeffrey Conn, Ariel Y. Deutch, Ronald B. Emeson, John H. Exton, Stephen Fesik, Alfred George Jr., Vsevolod Gurevich, Heidi E. Hamm, Kenneth R. Hande, Christine L. Konradi, Daniel Liebler, Craig Lindsley, MacRae Linton, Terry Lybrand, Robert Macdonald, Lawrence J. Marnett, Peter R. Martin, Richard McCarty, Douglas McMahon, Herbert Y. Meltzer, John A. Oates, L. Jackson Roberts II, David Robertson, Dan M. Roden, Sandra Rosenthal, Elaine Sanders-Bush, Richard Shelton, C. Michael Stein, Ronald G. Wiley, Laurence Zwiebel
RESEARCH PROFESSOR David Hachey
ADJUNCT PROFESSORS John T. Clark, Pat Levitt, Lee E. Limbird, Sukhbir Mokha, Martin Ogletree
ASSOCIATE PROFESSORS EMERITI Erwin J. Landon, Peter W. Reed
ASSOCIATE PROFESSORS Joseph A. Awad, Richard M. Breyer, Chang Chung, William A. Hewlett, Bjorn Knollmann, Patricia Labosky, Michael J. McLean, Paul Moore, Katherine T. Murray, Bih-Hwa Shieh, Brian E. Wadzinski
RESEARCH ASSOCIATE PROFESSORS Olivier Boutaud, Sabina Kupershmidt, Colleen M. Niswender, Christine Saunders, C. David Weaver, Huiyong Yin, Tao Yang
ADJUNCT ASSOCIATE PROFESSORS Sanika Chirwa, Darryl B. Hood
ASSISTANT PROFESSORS Christopher B. Brown, Ana M. Carneiro, Kevin Currie, Sean S. Davies, Jerod Denton, Florent Elefteriou, Anthony C. Forster, Eugenia Gurevich, Maureen Hahn, Eva M. Harth, Charles Hong, Tina M. Iverson, James M. Luther, Gregory C. Mathews, BethAnn McLaughlin, Jens Meiler, Satish Raj, Rebecca Sappington, Claus Schneider, Jonathan Schoeneoker, Benjamin Spiller, Gregg D. Stanwood, Jeremy Veenstra-Vander Weele, Xiangli Yang, Qi Zhang, Tao Peter Zhong
RESEARCH ASSISTANT PROFESSORS David Airey, Randy S. Barrett, Michael Bubser, Eric Dawson, Kyle A. Emmitte, Paul Gresch, Corey Hopkins, Carrie K. Jones, Ginger L. Milne, Stephen Milne, Aurea Pimenta, Anita Preininger, Shaun Stauffer, Alex Waterson, Michael Wood, Zixiu Xiang, Chong-Bin Zhu
ADJUNCT ASSISTANT PROFESSORS Habibeh Khoshbouei, Susan Mercer
INSTRUCTORS Harish Prasad, Alice Rodriguez
RESEARCH INSTRUCTORS Liping Du, Kristopher Kahlig, Alicia Ruggiero, Sergey Vishnivetsky, Ning Wang
ADJUNCT INSTRUCTOR Dawn Matthies

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.*

Course descriptions begin on page 138.

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 Marilyn Friedman, Lenn E. Goodman, Michael P. Hodges, John Lachs, Larry May, Kelly Oliver, Lucius T. Outlaw Jr., Charles E. Scott, Robert Talisse, David Wood
ASSOCIATE PROFESSORS Idit Dobbs-Weinstein, Gregg M. Horowitz, José Medina, Jeffrey Tlumak, Julian Wuerth
ASSISTANT PROFESSORS Joan Grassbaugh Forry, David Miguel Gray, Lisa Guenther, Elizabeth Jelinek

DEGREES OFFERED: *Master of Arts (en route and 4+1), Doctor of Philosophy*

WORK for the Ph.D. degree is offered in all major fields in the discipline. Candidates must complete at least 47 hours of formal course work and satisfy additional requirements. When appropriate, course work may include a limited number of seminars in other disciplines. A 4+1 M.A. is also offered for qualified Vanderbilt undergraduates. For further details and current information, see the Department of Philosophy webpage: *www.vanderbilt.edu/AnS/philosophy.*

Course descriptions begin on page 138.

Physics and Astronomy

CHAIR Robert J. Scherrer
DIRECTOR OF GRADUATE STUDIES Julia Velkovska
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, Sandra J. Rosenthal, 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, M. Shane Hutson, Will E. Johns, Keivan G. Stassun, Julia Velkovska
RESEARCH ASSOCIATE PROFESSORS Anthony B. Hmelo, Marcus H. Mendenhall, Mark P. Oxley
ASSISTANT PROFESSORS Andreas Berlind, Kirill Bolotin, James Dickerson, Dennis Michael Duggan, Daniel F. Gochberg, Kelly Holley-Bockelmann, Kalman Varga, Yaqiong Xu
RESEARCH ASSISTANT PROFESSORS Sergey Avanesyan, Iskander Batyrev, Leonard Alan Bradshaw, Bibo Feng, William E. Gabella, Juan-Carlos Idrobo, Joshua Pepper, Alan Tackett, Momchil Velkovsky

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

PHYSICS AND ASTRONOMY are driving intellectual forces that expand our understanding of the universe, discover the science that underlies new technologies, and applies these technologies to both curiosity-driven and applied research. In keeping with this role, the Department of Physics and Astronomy has active research groups studying the theoretical and experimental physics of elementary particles; nuclear structure, heavy-ion reactions, and relativistic heavy-ion physics; linear and nonlinear interactions of photons, electrons, atoms, and molecules with nanocrystals, surfaces, and interfaces; the electric, magnetic, and active mechanical properties of living systems; the structure and dynamics of biopolymers; the physics and technology of medical imaging; computational physics; low mass and young stars; detection of extrasolar planets; structure and dynamics of galaxies; observational and theoretical cosmology; ultra-high energy cosmic rays; 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.

Course descriptions begin on page 73 for Astronomy and on page 140 for Physics.

Political Science

CHAIR John G. Geer
ASSOCIATE CHAIR David E. Lewis
DIRECTOR OF GRADUATE STUDIES Jonathan T. Hiskey
PROFESSORS EMERITI Robert H. Birkby, Erwin C. Hargrove, William C. Havard Jr., M. Donald Hancock, Richard A. Pride, Harry Howe Ransom, Benjamin Walter
PROFESSORS William James Booth, John G. Geer, Marc J. Hetherington, David E. Lewis, Bruce I. Oppenheimer, James Lee Ray, Mitchell A. Seligson, Carol M. Swain
ASSOCIATE PROFESSORS Brooke A. Ackerly, Joshua D. Clinton, Jonathan T. Hiskey, Cindy D. Kam, Alan Wiseman, Elizabeth J. Zechmeister
ASSISTANT PROFESSORS Carol Atkinson, Brett V. Benson, Katherine B. Carroll, Giacomo Chiozza, Pamela C. Corley, Suzanne Globetti, Monique L. Lyle, Michaela Mattes, Emily Nacol, Efrén O. Pérez, Zeynep Somer-Topcu

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.

Course descriptions begin on page 143.

Portuguese

See Spanish and Portuguese

Psychological Sciences

CHAIRS Andrew J. Tomarken, A&S; David A. Cole, Peabody
DIRECTORS OF GRADUATE STUDIES Thomas J. Palmeri, A&S; Daniel Levin, Peabody
DIRECTORS OF CLINICAL TRAINING Jo-Anne Bachorowski, A&S; Bruce Compas, Peabody
PROFESSORS EMERITI Alfred A. Baumeister , Penelope H. Brooks, William F. Caul, Keith N. Clayton, Jeffery J. Franks, H. Carl Haywood, Martin Katahn, Joseph S. Lappin, John R. Newbrough, Richard D. Odom, Leslie Phillips, William P. Smith, Warren W. Webb
PROFESSORS Camilla P. Benbow, Leonard Bickman, Randolph Blake, David A. Cole, Bruce E. Compas, Vivien A. Casagrande, David S. Cordray, Paul R. Dokecki, Elisabeth M. Dykens, Ford F. Ebner, Dale Farran, Robert Fox, Judy Garber, Isabel Gauthier, James H. Hogge, Steven D. Hollon, Jon H. Kaas, Ann P. Kaiser, Daniel Levin, Gordon D. Logan, David Lubinski, Bruce McCandliss, Timothy P. McNamara, Amy Needham, Sohee Park, John J. Rieser, Anna Roe, Howard M. Sandler, Jeffrey D. Schall, James H. Steiger, Tedra Ann Walden, Lynn S. Walker
ASSOCIATE PROFESSORS Jo-Anne Bachorowski, Kathleen V. Hoover-Dempsey, Robert B. Innes, René Marois, Laura R. Novick, Thomas J. Palmeri, Bethany Rittle-Johnson, Megan Saylor, David G. Schlundt, Craig A. Smith, Andrew J. Tomarken, Frank Tong, Georgene L. Troseth, Bahr Weiss, David Zald
RESEARCH ASSOCIATE PROFESSOR Georgine M. Pion
ASSISTANT PROFESSORS Stephen D. Benning, Sun-Joo Cho, Denise Davis, Bunmi O. Olatunji, Sean Polyn, Adriane Seiffert, Sonya Sterba, Geoffrey Woodman
RESEARCH ASSISTANT PROFESSORS Christine Collins, Chase A. Lesane-Brown, Leslie Kirby, Julia Noland, Hui-Xin Qi, Iwona Stepniewska
ASSISTANT CLINICAL PROFESSOR Vicki S. Harris
SENIOR LECTURERS Leslie Kirby, Steven McFadyen-Ketchum, Elisabeth Sandberg, Leslie Smith
LECTURERS Gayathri Narasimham, Leigh Wadsworth

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

THE doctoral program in psychological sciences is offered jointly by the Department of Psychology in the College of Arts and Science and the Department of Psychology and Human Development in Peabody College. The Psychological Sciences program focuses on psychological theory and the development of original empirical research. Students are admitted to work toward the Ph.D. degree in the following areas:

- Clinical Science
- Cognition and Cognitive Neuroscience
- Developmental Science
- Neuroscience
- Quantitative Methods and Evaluation

A major goal of our doctoral program is the placement of its graduates in academic settings. The faculty attempt always to tailor graduate training to meet the needs and the interests of each individual student. Students are monitored very closely from the beginning of their training, and emphasis is on active student participation during every stage of training.

The curriculum is designed to: (a) familiarize students with the major areas of psychology; (b) provide specialized training in at least one of the five specific areas of psychology emphasized in the program; and (c) provide students sufficient flexibility to enroll in classes consistent with their interests and long-term developmental trajectory. During the first two to three years, students take several core courses in quantitative methods and in substantive areas. Beyond this, the program consists of seminars, further research participation, and other inquiries expressly designed to fulfill career objectives. Each of the five areas offers a seminar on current research every semester, attended by all faculty and graduate students in that area.

We expect students to be continually involved in research throughout their tenure in our program. We use a one-on-one mentoring model as a primary though not exclusive means of advisement for the acquisition of scientific skills by students. As such, students work very closely with their advisers in all phases of the research process. In addition, advisory

committees that consist of both the adviser and other faculty members offer guidance throughout the student's graduate school years. There is the potential for considerable interaction among programs and with other disciplines across campus. This interaction produces an exciting intellectual environment that is further enriched by visiting faculty members and speakers. Interested students are encouraged to find out more about our research programs by reading the descriptions of faculty research interests available on our departmental website (*www.vanderbilt.edu/psychological_sciences).*

The Clinical Science program in Psychological Sciences at Vanderbilt subscribes to the clinical scientist model of training, with the primary goal of training clinical scientists. The program has two training tracks: a Generalist track with emphases in adult psychopathology, basic cognitive and emotional processes, clinical neuroscience, and health psychology, and a Child, Adolescent, and Family (CAF) track with emphases in developmental psychopathology, pediatric psychology, prevention, and intervention. Regardless of track, the training experience includes a core curriculum, a common set of course requirements and research milestones, and a variety of practicum opportunities.

All of our Ph.D. program areas offer a range of support options for graduate students, including research fellowships, research assistantships, teaching assistantships, and graduate fellowships.

Applicants to our program need to submit scores on the General test and we recommend one 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.

Specific program requirements are described in the *Graduate Student Handbook,* which is available on the Psychological Sciences website.

The Department of Psychology and Human Development offers a master of education (M.Ed.) in child studies that is described in the Peabody College catalog. Outside of this program, master's degrees are generally only available to those students who are accepted into the Ph.D. program.

Course descriptions for courses offered through the Department of Psychology in the College of Arts and Science begin on page 146.

Course descriptions for courses offered through the Department of Psychology and Human Development in Peabody College begin on page 148.

Religion

CHAIR Paul J. DeHart
ASSOCIATE DEAN FOR GRADUATE EDUCATION AND RESEARCH James P. Byrd
PROFESSORS EMERITI/A David G. Buttrick, Edward Farley, H. Jackson Forstman, Frank Gulley Jr., Charles H. Hambrick, Walter Harrelson, Peter C. Hodgson, Joseph C. Hough Jr., Dale A. Johnson, Sallie McFague, Eugene TeSelle, Richard M. Zaner
PROFESSORS Victor Anderson, Dale Andrews, Lewis V. Baldwin, Sandra Barnes, J. Patout Burns, Larry Churchill, Dennis C. Dickerson, Paul R. Dokecki, Volney P. Gay, Lenn E. Goodman, Thomas A. Gregor, James Hudnut-Beumler, Robin M. Jensen, Douglas A. Knight, Amy-Jill Levine, Leah Marcus, John S. McClure, M. Douglas Meeks, Bonnie J. Miller-McLemore, Daniel M. Patte, Jack M. Sasson, Fernando F. Segovia, David J. Wasserstein, D. Don Welch Jr.
ASSOCIATE PROFESSORS Ellen T. Armour, Gregory F. Barz, Beth Ann Conklin, Paul J. DeHart, Idit Dobbs-Weinstein, Kathleen Flake, Juan Floyd-Thomas, Stacey Floyd-Thomas, William Franke, Kathy L. Gaca, Jay Geller, Joel F. Harrington, Thomas McGinn, Richard McGregor
ASSISTANT PROFESSORS Annalisa Azzoni, James P. Byrd, William J. Hook, Susan Hylen, Paul C. H. Lim, Herbert Marbury, Barbara McClure, Graham Reside, Ted A. Smith, Melissa Snarr, John J. Thatamanil, Martina Urban, Gay House Welch

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.

M.A. candidates demonstrate reading competence in foreign languages, ancient or modern, as required in the program or area of concentration. Students should consult area policies for specific requirements. In most cases, however, reading knowledge in one foreign language is required for the M.A. Students will normally 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 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) and (2) Religion, Gender, and Sexuality (offered through the Carpenter program in Religion, Gender, and Sexuality, *www.vanderbilt.edu/divinity/carpenter).*

Course descriptions begin on page 149.

Social Psychology

The goal of the interdisciplinary program in social psychology has been to provide doctoral students with the opportunity to pursue a major concentration in social psychology through the graduate program in psychology, sociology, or management (organization studies), or a minor in social psychology 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 Kenneth A. Wallston (Psychological Science); Bruce Barry, Jennifer Escalas, and Raymond Friedman (Management); and Douglas D. Perkins (Community Research and Action). The committee is currently evaluating the program, which is on hold for the 2010/2011 academic year.

Sociology

CHAIR Katharine Donato
DIRECTOR OF GRADUATE STUDIES TBA
PROFESSORS EMERITI Ernest Q. Campbell, Jack P. Gibbs, Walter R. Gove
PROFESSORS Daniel B. Cornfield, Katharine Donato, Larry W. Isaac, Gary F. Jensen, Holly J. McCammon, Ronnie Steinberg, R. Jay Turner
ASSOCIATE PROFESSORS George Becker, Tony Brown, Karen E. Campbell, Laura Carpenter, André Christie-Mizell, Richard Lloyd, Mariano Sana
ASSISTANT PROFESSORS Tyson Brown, Shaul Kelner, Jennifer Lena, Evelyn Patterson, Richard Pitt, Lijun Song, Steven J. Tepper

DEGREE OFFERED: *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, 323, 373, and 15 hours of electives (including at least one methods seminar, two survey seminars, and one special topic seminar). 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 36 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.

Course descriptions begin on page 163.

Spanish and Portuguese

CHAIR Cathy L. Jrade
VICE CHAIR Victoria A. Burrus
DIRECTOR OF GRADUATE STUDIES Christina Karageorgou-Bastea
PROFESSORS EMERITI J. Richard Andrews, John L. Bingham, John Crispin, Russell G. Hamilton, C. Enrique Pupo-Walker, Francisco Ruiz-Ramón
PROFESSORS Earl Fitz, Edward Friedman, Cathy L. Jrade, William Luis, René Prieto, Philip D. Rasico
ASSOCIATE PROFESSORS M. Frăncille Bergquist, Susan Berk-Seligson, Victoria A. Burrus, Carlos A. Jáuregui, Christina Karageorgou-Bastea, Emanuelle K. F. Oliveira, Benigno Trigo, Andrés Zamora
ASSISTANT PROFESSOR Neica Michelle Shepherd

DEGREES OFFERED:

SPANISH. Master of Arts, Doctor of Philosophy
SPANISH-PORTUGUESE. Doctor of Philosophy
SPANISH-PORTUGUESE. With specialization in Comparative Literature, Doctor of Philosophy
SPANISH-PORTUGUESE. With specialization in Inter-American Literature, 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 and Portuguese with a specialization in Comparative Literature requires 72 hours of course work, with at least 30 hours coming from Spanish and/or Spanish American literature, at least 21 from our Portuguese, Lusophone African, and Brazilian literature courses, and another 21 from a related language field, such as English, French, German, or Classics, or from a related area of humanistic endeavor such as history, religion, Latin American studies, art, the history of art, philosophy, literary theory, or music. Candidates must demonstrate near-native fluency in either Spanish or Portuguese (proficiency in the other language must be acquired or demonstrated at Vanderbilt) and English and demonstrate, by means of a detailed plan of study, a commitment to developing an interdisciplinary doctoral program that focuses on a core, or unifying, theme and that emphasizes a rigorously comparative methodology. The program is designed to allow students to satisfy the requirements for the Ph.D. within five years. The contact person for this area of specialization is Professor Earl Fitz at *earl.e.fitz@vanderbilt.edu*.

The Ph.D. in Spanish and Portuguese 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 is the development of fluency in Spanish, Portuguese, and English and the development of a course of study that is comparative and inter-American in its design. Candidates must demonstrate near-native fluency in either Spanish or Portuguese (proficiency in the other language must be acquired or demonstrated here at Vanderbilt) and in English. 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; for reasons of course availability the third recommended area of expertise), French (Canadian and Caribbean; subject to course availability), and Latin American studies (cultural anthropology). 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*.

Course descriptions begin on page 146 for Portuguese and on page 164 for Spanish.

Special Education

CHAIR Mark Wolery
DIRECTOR OF GRADUATE STUDIES Stephen E. Graham
PROFESSORS 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, Laurie Cutting, Deborah D. Hatton, Mary Louise Hemmeter, Kathleen L. Lane, Joseph H. Wehby
ASSOCIATE PROFESSOR OF THE PRACTICE Kimberly Paulsen
ASSISTANT PROFESSORS 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 proseminar 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. Students who enter without a master's degree may earn a thesis-based M.S. degree while working on their Ph.D.

Course descriptions begin on page 166.

Teaching and Learning

See Learning, Teaching, and Diversity

Women's and Gender Studies

DIRECTOR Charlotte Pierce-Baker
ASSOCIATE DIRECTOR Rory Dicker

VANDERBILT University's Women's and Gender Studies program 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.

Course descriptions begin on page 169.

Graduate School Courses

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.

African American and Diaspora Studies

AADS 265. Twentieth-Century African American Biography. Biographies and autobiographies as lenses for the study of historical trends and events; development of gender, sexual, and racial identities in subjects. [3]

AADS 300. Theories of Diaspora. Interdisciplinary introduction to materials, methods, debates, and theoretical language of scholarly research in Diaspora Studies. [3]

AADS 395a. Directed Study. [3]

AADS 395b. Directed Study. [3]

American Studies

AMER 300. Graduate Workshop in American Studies. Issues, methodologies, traditions, approaches, and problems in the interdisciplinary field of American Studies. [4]

AMER 301a. Independent Study. [1-3 each semester]

AMER 301b. Independent Study. [1-3 each semester]

Anthropology

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

ANTH 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 ethno¬graphic investigation. [3]

ANTH 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. [3]

ANTH 207. Environmental Anthropology. The relationship between human beings and the environments that sustain them. 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]

ANTH 208. Food Politics in America. The cultural, social, political, and economic contexts of the contemporary food system. Issues of health and nutrition. Land use, ecological relations, food chains, and links to climate change. Ethics of food production, distribution, and consumption. Agricultural policy, immigration, work conditions, animal welfare, and local economies. Roles of citizens and consumers. Rise of movements seeking sustainable alternatives. [3]

ANTH 209. Global Wealth and Poverty. The production of inequality. How wealth is accumulated, lost, exchanged, and displayed; how poverty is created, endured, and overcome. Explanations in terms of luck, hard work, immorality, occult forces, and public policies. Case studies. [3]

ANTH 210. Culture and Power in Latin America. Survey of native cultures and Spanish and Portuguese heritage. Fundamental traditions, including marriage and the family, the relationship between men and women, racial and ethnic identity, social class, and religion. Peasant communities and contemporary urban life. [3]

ANTH 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. [3]

ANTH 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. [3]

ANTH 213. The Archaeology of the Ancient Maya Civilization. Case study in cultural evolution. Archaeological evidence and social theory on the enigmatic origins, complex nature, and sudden collapse of the ancient Maya civilization. [3]

ANTH 214. Native North Americans. Indian societies of North America; their archaeological origins, development, and changing adaptation to white society. [3]

ANTH 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. [3]

ANTH 216. Ancient Cities. Comparative examination of early cities in the Old World and pre-Columbian America. Analysis of social and economic processes supporting preindustrial urbanism. Role of geography, ideology, trade, and settlement systems in the rise of early urban societies. [3]

ANTH 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]

ANTH 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. [3]

ANTH 220. Culture and Power in Mesoamerica. 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]

ANTH 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]

ANTH 222. Anthropologies and Archaeologies of Community. Creation, maintenance, and transformation of communities through time. Community as a village or settlement, and as an "imagined" or virtual aspect of social identity. Behaviorist, interactionist, discursive, and identity-oriented anthropological approaches to community. Community organization and the built environment. Ancient and modern case studies. [3]

ANTH 224. Political Anthropology. 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]

ANTH 225. Social Movements. Collective action, past and present. Class-and identity-based movements, transnational activism, and networks. The early U.S. labor movement; 1960s gay, women's and civil rights movements. Global struggles for social justice. [3]

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

ANTH 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]

ANTH 231. Colonial Encounters in the Americas. Theoretical discussion of colonialism as a sociocultural 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]

ANTH 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. [3]

ANTH 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]

ANTH 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. [3]

ANTH 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]

ANTH 246. Andean Culture and Society. 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. [3]

ANTH 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; ethno¬graphic study of modern descendants of the Aztecs. [3]

ANTH 248. Ancient Andean Civilizations. 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]

ANTH 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. Government policies, human rights, environmentalism, sustainable development, and indigenous activism and advocacy. [3]

ANTH 250. Anthropology of Healing. Ritual, symbols, belief, and emotion in health, illness, and therapeutic processes. 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]

ANTH 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. [3]

ANTH 260. Medicine, Culture, and the Body. (Also listed as History 283) 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]

ANTH 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. Role of socio-economic status in literacy. [3]

ANTH 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]

ANTH 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]

ANTH 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]

ANTH 266. Gender and Cultural Politics. Cross-cultural comparison of women's roles and status 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]

ANTH 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. [3]

ANTH 268. Introduction to Language Contact. Structural, social, and cultural issues involved in protracted contact between speakers of different languages. Bilingualism and multilingualism, lexical and structural borrowing, nativization, code switching, and Pidgins and Creoles. Linguistic psychosocial theories regarding common contact patterns. The sociocultural meaning of language contact in different societies. Case studies. [3]

ANTH 269. Introduction to a Maya Language. Beginning instruction in Kaqchikel, K'ichee', or Q'eqchi'. Basic speaking, reading, and writing skills. Three weekly hours of class time and at least two hours of drill practice. [5]

ANTH 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. [3]

ANTH 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. [3]

ANTH 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]

ANTH 276. Modern Yucatec Maya. Present-day Yucatec Maya as spoken in Yucatan and Belize. Methods of linguistic analysis. Basic speaking, comprehension, and writing skills. [5]

ANTH 277. Conversational K'iche' Maya. Intermediate level course with advanced grammar. Counterfactual constructions, deixis, verbal derivations of positional roots, sound symbolic verbs, and verbal nominalizations. Vocabulary, idioms; various literary genres. Prerequisite: 269. [5]

ANTH 278. Advanced K'iche' Maya. Vocabulary, listening, and speaking skills; modern and colonial texts; cultural context of linguistic practices in K'iche communities. Prerequisite: 277. [5]

ANTH 279. Ceramic Analysis in Archaeology. Ceramic sherds and vessels from ancient societies. Documentation of form, fabric, and decoration through illustrations. Qualitative and quantitative analysis. Integration with archaeological contexts for ceramic sequences and chronology. Technology, production, exchange, and consumption. Function and style. Emphasis on hands-on experience. [3]

ANTH 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. [3]

ANTH 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. [3]

ANTH 282. Anthropological Approaches to Human Landscapes. Anthropological approaches to 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]

ANTH 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]

ANTH 286. Activism and Social Change: Theory, Experience, and Practice. Introduction to theory and ethics of social activism and advocacy. Roles of academics and scholars. Theories of political organizing and mobilization. Application of anthropological research methods. Case studies in local, national, and global social issues, processes of civic mobilization, and social change. [3]

ANTH 287a. Internship Readings and Research. Readings and research conducted under the supervision of a member of the Anthropology department and a substantial research paper are required. Students from any discipline can gain experience working with a local, national, or international organization in developing a project to broaden their understanding of anthropological issues. Hours for background readings and research will be completed in ANTH 287a concurrently with and regardless of the numbers of hours taken in internship training in 287b. Normally a 2.90 grade point average, 6 hours of prior work in ANTH, and prior approval of the student's plan by the director of undergraduate studies in Anthropology are required. A research paper and report must be submitted at the end of the semester during which the internship training is completed. Corequisite: 287b. [Variable credit: 1-6]

ANTH 287b. Internship Training. Offered on a Pass/Fail basis only and must be taken concurrently with 287a. Hours of 287b will not count toward the Anthropology major or minor. Students from any discipline can gain experience working with a local, national, or international organization in developing a project to broaden their understanding of anthropological issues. Hours for background readings and research will be completed in ANTH 287a concurrently with and regardless of the numbers of hours taken in internship training in 287b. Normally a 2.90 grade point average, 6 hours of prior work in ANTH, and prior approval of the student's plan by the director of undergraduate studies in Anthropology are required. A research paper and report must be submitted at the end of the semester during which the internship training is completed. Corequisite: 287a. [Variable credit: 1-9]

ANTH 288a. Independent Research. Readings on selected topics (of the student's choice) and the preparation of reports. [1-3]

ANTH 288b. Independent Research. Readings on selected topics (of the student's choice) and the preparation of reports. [1–3]

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

ANTH 294. Special Topics. Topics vary. [3]

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

ANTH 307. Human Variation and Osteology. Survey of physical and genetic variation in modern human populations. Laboratory techniques in osteological analysis. [3]

ANTH 310. Archaeological Method and Theory. Development of archaeology as a discipline; relationships with anthropology and history; intellectual trends. Prerequisite: consent of instructor. [3]

ANTH 312. GIS for Anthropology Research. Theoretical and methodological training for advanced GIS applications in anthropological research. Implementing GIS in research design, field spatial data acquisition methods, data processing, management, visualization, and analysis. [3]

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

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

ANTH 318. Political Violence. Comparative and ethnographic analysis of state violence, guerrilla insurgencies, paramilitarism and vigilantism; consequences of repression, impunity, and social fragmentation on historical memory and democratic processes. [3]

ANTH 320. Seminar in Ethnography. Ethnographic method and theory. Techniques of describing and understanding unfamiliar cultures. Prerequisite: consent of instructor. [3]

ANTH 321. Seminar in Social Organization. The study of organization from a comparative perspective. [3]

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

ANTH 323. Seminar on Political Economy and Anthropology. Anthropological approaches to political economy and globalization. Fundamental works in political economy and economic anthropology. [3]

ANTH 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]

ANTH 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]

ANTH 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]

ANTH 330. Research Design in Anthropology. Research design, formulating research questions, and definition of appropriate data and methods. [3]

ANTH 331. Preindustrial Political Systems. History, structure, and change of pre-modern political systems around the world. [3]

ANTH 335. Space, Place, and Landscape. Cross-disciplinary approaches to the significance of space and landscape for human societies in the past and present. [3]

ANTH 340. Historical Archaeology. Development, practice, methods, and theoretical perspectives in historical archaeology; relationships between archaeology and history. [3]

ANTH 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]

ANTH 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. [3]

ANTH 360. Seminar in South American Archaeology and Ethnohistory. The prehistory of pre-Columbian civilizations of the Andean and lowland regions of South America. [3]

ANTH 367. Special Topics. Problems, themes, or issues in anthropological theory and methods. May be repeated with change of content. [1-3]

ANTH 369. Master's Thesis Research. [0]

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

ANTH 399. Ph.D. Dissertation Research.

Arabic

ARA 101g. Arabic for Graduate Reading. Survey of grammar and vocabulary, with extensive reading. Available only to graduate students for "No Credit". [0]

ARA 210a. Elementary Arabic. Development of reading, listening, speaking, and writing skills. [5]

ARA 210b. Elementary Arabic. Continuation of 210a. Development of reading, listening, speaking, and writing skills. [5]

ARA 220a. 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 per week of individual work in the language laboratory. Prerequisite: 210b or equivalent by examination. [4]

ARA 220b. Intermediate Arabic. Continuation of 220a. 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 per week of individual work in the language laboratory. Prerequisite: 220a or equivalent by examination. [4]

ARA 230a. 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. [3]

ARA 230b. Advanced Arabic. Continuation of 230a. Further development of listening, reading, speaking, and writing skills in the Arabic language. Emphasis on grammar and literary techniques. Prerequisite: 2 years of Arabic or equivalent. [3]

ARA 240. Media Arabic. Listening to, discussing, simulating, and analyzing Arabic media materials. Coverage of current and historical events, such as TV broadcasts, headline news, documentaries, and public discussions on political, religious, and cultural issues. Prerequisite: 230b. [3]

ARA 250. Arabic of the Qur'an and Other Classical Texts. Syntactical and morphological features of Classical Arabic. Differences and similarities with Modern Standard Arabic in vocabulary usage, semantic extensions, and context; vocabulary borrowing. Texts drawn from the Qur'an, Hadith, and Sira (biographical) literature. Prerequisite: 240. [4]

Asian Studies

ASIA 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. [3]

ASIA 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. [3]

ASIA 218. Introduction to Classical Chinese. The grammar and lexicon of Classical Chinese. Comparisons with Modern Chinese. Parables and anecdotes from philosophical and historiographical texts written between the fifth century BCE and the first century CE. Prerequisite: CHIN 214-216. [3]

ASIA 220. Modern Chinese Fiction. Short stories and novels of 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. [3]

ASIA 225. Sex and Gender in Premodern Chinese Culture. Antiquity to the nineteenth century. Philosophical and medical concepts of sexual

difference; political and religious allegories of love and transsexuality; literary imaginations of body and gender performance. All readings in English translation. [3]

ASIA 236. Exploring China: Business, Culture, and Language in Beijing, Xi'an, and Shanghai. A four-week summer course at Fudan University in Shanghai, China. First-hand experience in Chinese society to develop Chinese language skills. No background in Chinese language required. [3]

ASIA 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. [3]

ASIA 289a. Independent Study. Designed primarily for majors who want to study East Asian subjects not regularly offered in the curriculum. Must have consent of instructor. [1-3]

ASIA 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. [1-3]

ASIA 294a. Special Topics. Seminars or lecture courses devoted to topics in areas of competence of individual instructors and of interest to students. [1–3]

ASIA 294b. Special Topics. Seminars or lecture courses devoted to topics in areas of competence of individual instructors and of interest to students. [1–3]

Astronomy

ASTR 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: either 116a or 121a and either Math 150a or 155a. [3]

ASTR 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: Mathematics 198, Physics 223 and either 225 or 225W. [3]

ASTR 253. Galactic Astrophysics. Interstellar matter and gaseous nebulae, the structure and evolution of normal galaxies, active galactic nuclei and quasars, and observational cosmology. Prerequisite: Mathematics 198 and either Physics 225 or 225W. [3]

ASTR 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 Schwartzschild 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]

ASTR 307a. Selected Topics in Astrophysics. Stellar atmospheres, stellar interiors, interstellar matter, binaries, variable stars, solar system physics, and galaxies. Prerequisite: consent of instructor. [3]

ASTR 307c. Selected Topics in Astrophysics. Stellar atmospheres, stellar interiors, interstellar matter, binaries, variable stars, solar system physics, and galaxies. Prerequisite: consent of instructor. [3]

ASTR 307d. Selected Topics in Astrophysics. Stellar atmospheres, stellar interiors, interstellar matter, binaries, variable stars, solar system physics, and galaxies. Prerequisite: consent of instructor. [3]

ASTR 310. Radiative Processes. Electromagnetic radiation from astrophysical sources. Radiative transfer; blackbody radiation; atomic and molecular absorption and emission; radiation from moving charges. Prerequisite: PHYS 229ab, 251ab. [3]

ASTR 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. [3]

ASTR 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. [3]

ASTR 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 Nbody problem, relaxation, dynamical friction, and the Fokker-Plank equation. Galaxy evolution from the standpoint of stellar populations, the initial mass function, chemical evolution, and galaxy interactions. [3]

ASTR 354. Structure Formation in the Universe. Dark matter and dark energy. Growth of linear and non-linear density fluctuations. Density and velocity fields, perturbation theory, and non-linear collapse models. Cosmological N-body simulations and the formation of dark matter halos. Galaxy clustering measurements and galaxy formation physics. Experimental cosmological probes of dark matter and dark energy. [3]

ASTR 355. Order of Magnitude Astrophysics. Order-of-magnitude estimates on astrophysical problems. May be taken for credit more than once. [1]

ASTR 369. Master's Thesis Research.

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

Biochemistry

BCHM-GS 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.

BCHM-GS 301. Molecular Structure and Function. This course considers the use of biochemical methods to answer important questions of function in systems involving interacting species. Protein-protein, protein-ligand, protein-nucleic acid, and nucleic acid-nucleic acid interactions are considered. Multiple approaches discussed include mutagenesis, kinetic, chemical, spectroscopic, and in vitro selection methods. SPRING. [2] Armstrong, Egli, Guengerich, Sanders, Schey.

BCHM-GS 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.

BCHM-GS 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.

BCHM-GS 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.

BCHM-GS 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.

BCHM-GS 327. Scientific Communication. This course will develop skills required for effective oral and written scientific communication. Students will present research from the current literature and will be required to write an NIH formatted grant proposal to be critiqued by faculty assigned by the course director. Students not working for a degree in biochemistry must have the consent of the instructor to enroll. FALL. [2] Schey, Wagner, Osheroff, Cortez.

BCHM-GS 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 and drugs. Prerequisite: organic chemistry and general biochemistry. Three lectures per week. FALL. [3] Armstrong, Guengerich, Liebler, Marnett, Pietenpol, Porter, Stone.

BCHM-GS 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. SPRING. [1] Hiebert and Staff.

BCHM-GS 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, Sanders, Koehler.

BCHM-GS 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.

BCHM-GS 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.

BCHM-GS 369. Master's Thesis Research.

BCHM-GS 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

BCHM-GS 381. Molecular Foundations of Medicine. Molecular Foundations of Medicine is designed to familiarize students with the cellular structures, biomolecules, and processes that constitute life, human health, and disease at the molecular level. The course employs an integrated approach to teach underlying principles of biochemistry, cell and tissue biology, and genetics with an emphasis on human systems and medical conditions. The inclusion of clinical correlation sessions, small groups, and laboratory sessions will further integrate and broaden course material and relate molecular processes to the study of human disease. Prerequisite: MSTP students only. FALL. [Variable credit: 1-6] Osheroff, George, Pettepher.

BCHM-GS 382. Structure, Function, and Development. Structure, Function, and Development is designed to provide students with the means to develop an effective understanding of the normal micro and macroscopic structure, function, and development of the human body. The course employs a coordinated, integrated approach to the presentation and learning of the disciplines of human gross anatomy, cell and tissue biology (histology), human development (embryology), and physiology in a context of clinical application. Prerequisite: MSTP students only. SPRING. [Variable credit: 1-3] Dalley, Strom, Pettepher.

BCHM-GS 399. Ph.D. Dissertation Research.

Biological Sciences

BSCI 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 transplan¬tation immunity, autoimmune and immunodeficiency diseases, and allergy. Prerequisite: 201 or 210. [3]

BSCI 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. [3]

BSCI 234. Microbial Population Biology. Evolution, ecology, and diversity of microorganisms, including bacteria, viruses, and mobile genetic elements. The universality of microbial life, modes of genome evolution, symbioses between microbes and animals, biotechnology applications, and the human microbiome. Prerequisite: 205, 210, or 238. [3]

BSCI 236. Parasitology. Biology and epidemiology of eukaryotic parasites of medical and veterinary significance. Diagnosis, treatment, and control of parasitic protists, platyhelminthes, nematodes, and arthropods. Impact on global health. Prerequisite: 110a-110b. [3]

BSCI 237. Ecology Lab. One three-hour laboratory and discussion period or field trip per week. Prerequisite or Corequisite: 238. [1]

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

BSCI 239. Behavioral Ecology. Theoretical and empirical research on shaping the evolution of behavior. The role of behavior in population regulation, habitat selection and spacing, foraging behavior, predatory-prey interactions, sexual selection, evolution of mating systems, new approaches to animal communication, game theory. Prerequisite: 110a–110b, 205. [3]

BSCI 240. Developmental Biology. Genetic, molecular, and cellular mechanisms underlying the development of vertebrate animals with emphasis on the principles of human development. Specification of embryonic polarity, generation, and patterning of germ layers; sex determination, cardiovascular development, neural tube morphogenesis and differentiation, embryonic and adult stem cells in homeostasis and regeneration. Prerequisite: 201 or 210. [3]

BSCI 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. [3]

BSCI 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. [3]

BSCI 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]

BSCI 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. [3]

BSCI 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. [3]

BSCI 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. [3]

BSCI 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 saltwater environments; altitude adaptation). Prerequisite: 201 or 220. [3]

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

BSCI 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. [3]

BSCI 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. Prerequisites: 210 and 201 or 226 or 265. [3]

BSCI 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. [3]

BSCI 272. Computational Genomics. Computational methods of analyzing genome content and structure. Genome visualization; alignment; identification of genes and their regulatory motifs and repetitive elements; novel sequencing technologies. Phylogenetics; population genomics; protein classification and annotation. Prerequisite: 110a and 110b. [3]

BSCI 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. [3]

BSCI 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. [3]

BSCI 290. Special Topics in Biological Sciences. Topics vary. May be taken for credit more than once by permission of the director of undergraduate studies. Prerequisite: 110a–110b. [3]

BSCI 320. Graduate Seminar in Biological Sciences. May be taken for credit more than once. [1]

BSCI 332. Seminar in Biological Rhythms. [Variable credit: 1–2]

BSCI 336. Seminar in Ecology and Evolutionary Biology. [Variable credit 1–2]

BSCI 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. [3]

BSCI 369. Master's Thesis Research.

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

BSCI 384. The Brain and Behavior. Brain and Behavior provides a basic understanding of the human central nervous system and human behavior. The format includes lectures, lab exercises, small-group discussions, and patient case presentations. Brain and Behavior integrates three areas of medical science: (1) neuroanatomy, physiology, and biochemistry; (2) psychopathology and systems neuroscience; and (3) pathology, pharmacology, and radiology. Prerequisites: MSTP students only. [1]

BSCI 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. [1–3]

BSCI 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. [2–4]

BSCI 399. Ph.D. Dissertation Research.

Biomedical Engineering

BME 251. Systems Physiology. An introduction to quantitative physiology from the engineering point of view. Descriptive physiology of several organ systems (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]

BME 252. Systems Physiology. An introduction to quantitative physiology from the engineering point of view. Descriptive physiology of several organ systems (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]

BME 253. Neuromuscular Mechanics and Physiology. Quantitative characterization of the physiological and mechanical properties of the neuromuscular system. Quantitative models of system components. Applications to fatigue, aging and development, injury and repair, and congenital and acquired diseases. Prerequisite: BME 251 and 101. SPRING. [3]

BME 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. Credit offered for only one of BME 258 and PHYS 228. SPRING. [3]

BME 263. Signal Measurement and Analysis. (Also listed as EECE 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: Probability and Statistics. FALL. [3]

BME 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 and 213L. FALL, SPRING. [4]

BME 272. Design of Biomedical Engineering Devices and Systems I. 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 are presented. A full-semester design project is required. Evaluation is conducted through periodic oral and written presentations, and through a final written and poster report. Corequisite for BME 272: BME 271; Prerequisite for BME 272-273: BME 251, 252. [2]

BME 273. Design of Biomedical Engineering Devices and Systems 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 are presented. A full-semester design project is required. Evaluation is conducted through periodic oral and written presentations, and through a final written and poster report. Corequisite for BME 272: BME 271; Prerequisite for BME 272-273: BME 251, 252; Prerequisite for BME 273: BME 271. [3]

BME 274. Principles and Applications of BioMicroElectroMechanical Systems (BioMEMS). The principles, design, fabrication and application of micro- and nano-devices to instrument and control biological molecules, living cells, and small organisms, with a strong emphasis on development of microfabricated systems and micro- and nano-biosensors. Students will lead discussions from the research literature. Graduate students will prepare a research proposal or fabricate a functioning BioMEMS device. FALL. [3]

BME 274L. BioMicroElectroMechanical Systems Laboratory. Design, fabrication, and testing of BioMEMS devices for applications in the life sciences. Practical experience in photolithography, replica molding to fabricate microfluidic devices, and multilayer devices to assemble microfluidic devices with active values. Corequisite: BME 274. FALL. [1]

BME 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: EECE 213, BME 101, and BME 210. Corequisite: BME 271; an imaging course may be helpful. SPRING. [3]

BME 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: BME 258 or equivalent. SPRING. [3].

BME 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. Applications of 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]

BME 281. Nanobiotechnology. Synthesis and characterization of nanostructured materials for use in living systems. Clinical applications of nanoscale biosensors. Methods for single molecule detection in biological specimens. Quantitative structure/function assessment of nanostructures in living systems. Prerequisite: one year of biology (BSCI 110a and 110b or equivalent) and transport phenomena (BME 210 or equivalent). SPRING. [3]

BME 281L. Nanobiotechnology Laboratory. Laboratory experiments in the characterization of nanomaterial interactions with living systems. Biological surface functionalization of inorganic nanoparticles. Measurement of cultured mammalian cell response to nanostructures. Quantitative structure/function assessment of nanostructures in living systems. Corequisite: BME 281. SPRING. [1]

BME 301A. Quantitative Methods in Biomedical Engineering. Mathematics, quantitative analysis and computation for biomedical engineering applications. Course is separated into three units: BME 301a-probability and statistics; BME 301b-signals and systems; and BME 301c-numerical analysis and computation. FALL. [1]

BME 301B. Quantitative Methods in Biomedical Engineering. Mathematics, quantitative analysis and computation for biomedical engineering applications. Course is separated into three units: BME 301a, probability and statistics; BME 301b, signals and systems; and BME 301c, numerical analysis and computation. FALL. [1]

BME 301C. Quantitative Methods in Biomedical Engineering. Mathematics, quantitative analysis and computation for biomedical engineering applications. Course is separated into three units: BME 301a, probability and statistics; BME 301b, signals and systems; and BME 301c, numerical analysis and computation. FALL. [1]

BME 302A. Applied Physics for Biomedical Engineering. Applied physics essential for biomedical engineering. Course is separated into three units: BME 302a-electromagnetics; BME 302b-optics; and BME 302c-mechanics. FALL. [1]

BME 302B. Applied Physics for Biomedical Engineering. Applied physics essential for biomedical engineering. Course is separated into three units: BME 302a, electromagnetics; BME 302b, optics; and BME 302c, mechanics. FALL. [1]

BME 302C. Applied Physics for Biomedical Engineering. Applied physics essential for biomedical engineering. Course is separated into three units: BME 302a, electromagnetics; BME 302b, optics; and BME 302c, mechanics. FALL. [1]

BME 303A. Cellular and Molecular Biomedical Engineering. Techniques and applications of cellular and molecular biology in biomedical engineering. Course is separated into three units: BME 303a-cellular/molecular systems; BME 303b-biomaterials; BME 303c-biotransport. SPRING. [1]

BME 303B. Cellular and Molecular Biomedical Engineering. Techniques and applications of cellular and molecular biology in biomedical engineering. Course is separated into three units: BME 303a, cellular/molecular systems; BME 303b, biomaterials; BME 303c, biotransport. SPRING. [1]

BME 303C. Cellular and Molecular Biomedical Engineering. Techniques and applications of cellular and molecular biology in biomedical engineering. Course is separated into three units: BME 303a, cellular/molecular systems; BME 303b, biomaterials; BME 303c, biotransport. SPRING. [1]

BME 304A. Measurement Methods for Biomedical Engineering. Instrumentation and imaging for quantitative measurements in biomedical applications. Course is separated into three units: BME 304a-biomedical instrumentation; BME 304b-image formation and properties; BME 304c-information content in biomedical images. SPRING. [1]

BME 304B. Measurement Methods for Biomedical Engineers. Instrumentation and imaging for quantitative measurements in biomedical applications. Course is separated into three units: BME 304a, biomedical instrumentation; BME 304b, image formation and properties; BME 304c, information content in biomedical images. SPRING. [1]

BME 304C. Measurement Methods for Biomedical Engineers. Instrumentation and imaging for quantitative measurements in biomedical applications. Course is separated into three units: BME 304a, biomedical instrumentation; BME 304b, image formation and properties; BME 304c, information content in biomedical images. SPRING. [1]

BME 305. Research and Professional Development in Biomedical Engineering. Database search strategies, interpreting engineering and

scientific literature, communication skills, engineering design, proposal writing, preparation of engineering publications, technology transfer/intellectual property, engineering laboratory documentation, regulatory oversight, ethics, funding. SPRING. [3].

BME 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: BME 101, BME 210 or equivalent. [3]

BME 317. Physiological Transport Phenomena. (Also listed as ChBE 317) The quantitative description of momentum transport (viscous flow) and mass transport (convection and diffusion) in living systems. Prerequisite: BME 210 or equivalent courses in fluid dynamics and mass transfer. SPRING. [3]

BME 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] (Offered alternate years)

BME 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]

BME 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]

BME 325. Physical Measurements on Biological Systems. 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. Prerequisite: Physics 225 (modern physics) or consent of instructor. SPRING. [3]

BME 329. Advanced Computational Modeling and Analysis in Biomedical Engineering. Survey of current topics within biomedical modeling: biotransport, biomechanics, tumor and virus growth dynamics, model-based medical imaging techniques, etc. Mathematical development and analysis of biomedical simulations using advanced numerical techniques for the solution of ordinary and partial differential equations. Emphasis will be on graduate research related topics. SPRING. [3]

BME 330. Cancer Imaging. Applications of noninvasive, in vivo imaging (i.e., MRI, optical, CT, SPECT, PET, and ultrasound) to cancer biology. Emphasis on assessing the response of tumors to treatment using emerging and quantitative imaging techniques. Prerequisites: BME 258 or BME 302b/304b/304c or PHYS 228. SPRING. (Offered alternate years) [3]

BME 331. Neuroimaging. Applications of noninvasive imaging techniques including MRI, fMRI, optical, EEG, and PET to the study of neural systems. Emphasis on the human brain, with a focus on current scientific literature. Prerequisites: BME 258 or BME 302b/304b/304c or PHYS 228. FALL. (Offered alternate years) [3]

BME 369. Master's Thesis Research.

BME 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: BME 272 or equivalent. SPRING. [3]

BME 377. Advanced Quantitative and Functional Imaging. Analysis of non-invasive image data to assess tissue structure and function in the body. Modeling and parameter estimation based on medical imaging data. Measurements of tissue volume, fiber structure, blood flow, brain function, and receptor density. Prerequisite: BME 301b, c and BME 304b, c or equivalent. No credit for both BME 277 and 377. FALL. [3]

BME 378. Magnetic Resonance Imaging Methods. MR techniques to image tissue for clinical evaluation and research. RF pulses, k-space trajectories, chemical shift, motion, flow, and relaxation. Derivation of signal equations for pulse sequence design and analysis. Course includes hands-on experimental studies. Prerequisites: BME 304b,c or equivalent. SPRING. [3]

BME 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

BME 389. Master of Engineering Project.

BME 391. Biomedical Research Seminar. Biomedical Research Seminar [1]

BME 392. Biomedical Research Seminar. Biomedical Research Seminar [1]

BME 393. Biomedical Research Seminar. Biomedical Research Seminar [1]

BME 394. Biomedical Research Seminar. Biomedical Research Seminar [1]

BME 395A. Special Topics. Different topics taught as a-d graduate level. [1-3]

BME 395B. Special Topics. Different topics taught as a-d graduate level. [1-3]

BME 395C. Special Topics. Different topics taught as a-d graduate level. [1-3]

BME 395D. Special Topics. Different topics taught as a-d graduate level. [1-3]

BME 399. Ph.D. Dissertation Research.

Biomedical Informatics

BMIF 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 and weekly programming exercises, 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, Weinberg.

BMIF 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. The group will then focus on algorithms for matching and aligning biological sequences, given the context of molecular evolution. The emphasis will move from comparing sequences to the systems developed to enable high-throughput DNA sequencing, genome assembly, and gene annotation. Gene products will be the next focus as students consider the algorithms supporting proteomic mass spectrometry and protein structure inference and prediction. The informatics associated with transcriptional microarrays for genome-wide association studies will follow. Finally, the class will examine biological networks,

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.

BMIF 311. Systems Biology. This survey course presents the student with the historical, conceptual, and technical foundations of systems biology as it relates to biomedical research using model systems as well as human disease. SPRING. [3] Levy.

BMIF 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] D. Giuse.

BMIF 316A. 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.

BMIF 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.

BMIF 318A. Research Rotation in Biomedical Informatics. Students will perform research under the direction of a faculty adviser. FALL. [1-1] Staff.

BMIF 318B. Research Rotation in Biomedical Informatics. Students will perform research under the direction of a faculty adviser. SPRING. [1-1] Staff.

BMIF 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 two major topic areas: (1) understanding the health care environment; and (2) understanding organizational informatics, including the implementation of informatics systems and the concepts of behavioral change management. Prerequisite: BMIF 300 is a required prerequisite to this course. SPRING. [3] Lorenzi.

BMIF 325. Epidemiology I.

BMIF 326. Biostatistics I.

BMIF 327. Clinical Trials.

BMIF 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, natural language processing and text mining, Bayesian networks, neural networks, decision trees, feature selection, SVM regression and unsupervised SVMs, hidden Markov models, 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.

BMIF 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.

BMIF 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)

BMIF 369. Master's Thesis Research.

BMIF 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.

BMIF 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

BMIF 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.

BMIF 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.

BMIF 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.

BMIF 399. Ph.D. Dissertation Research.

Biomedical Sciences

IGP 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.

IGP 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.

IGP 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.

IGP 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.

IGP 303. Responsible Conduct in Research. Formal lectures and small group discussions 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.

IGP 310. MSTP Seminar Series. The MSTP Seminar Series is a student-driven course in research guided by faculty preceptors. Formal objectives are: 1. To foster development of critical-thinking skills by appraisal of contemporary scientific literature. 2. To enhance scientific creativity through discussion of experimental approaches and techniques. 3. To develop oral presentation skills. The seminar series is interdisciplinary in scope with topics drawn from all areas of biomedical research The primary focus is on cutting-edge, discovery-based, and hypothesis-driven science. Students in the MSTP have primary responsibility for choosing the manuscripts to be presented as centerpieces of the seminars. More advanced students are expected to play a key role in mentoring before, during, and after junior student presentations. MSTP students only. Other students with specific permission of the Course Director. FALL, SPRING [1] Dermody

IGP 360. Lab Research.

IGP 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

IGP 399. Ph.D. Dissertation Research.

Biostatistics

BIOS 301. Introduction to Statistical Computing. This course is designed for students who seek to develop skills in statistical computing. Students will learn how to use R and STATA for data management, database querying, reporting generating, data presentation, and data tabulation and summarization. Topics will include organization and documentation of data, input and export of data sets, methods of cleaning data, tabulation and graphing of data, programming capabilities, and an introduction to simulations and bootstrapping. Students will also be introduced to LaTeX and Sweave for report writing. Students will also be briefly introduced to SAS and SQL programming. FALL. [2] Staff.

BIOS 311. Principles of Modern Biostatistics. This is the first in a two-course series designed for students who seek to develop skills in modern biostatistical reasoning and data analysis. Students learn the statistical principles that govern the analysis of data in the health sciences and biomedical research. Traditional probabilistic concepts and modern computational techniques will be integrated with applied examples from biomedical and health sciences. Statistical computing uses software packages STATA and R; prior familiarity with these packages is helpful but not required. Topics include: types of data, tabulation of data, methods of exploring and presenting data, graphing techniques (boxplots, q-q plots, histograms), indirect and direct standardization of rates, axioms of probability, probability distributions and their moments, properties of estimators, the Law of Large numbers, the Central Limit Theorem, theory of confidence intervals and hypothesis testing (one sample and two sample problems), paradigms of statistical inference (Frequentist, Bayesian, Likelihood), introduction to non-parametric techniques, bootstrapping and simulation, sample size calculations and basic study design issues. One hour lab required; Students are required to take 311L concurrently. Prerequisite: Calculus I. FALL. [3] Staff.

BIOS 311L. Principles of Modern Biostatistics Lab. This is a discussion section/lab for Principles of Modern Biostatistics. Students will review relevant theory and work on applications as a group. Computing solutions and extensions will be emphasized. Students are required to take 311 concurrently. FALL. [1] Staff.

BIOS 312. Modern Regression Analysis. This is the second in a two-course series designed for students who seek to develop skills in modern biostatistical reasoning and data analysis. Students learn modern regression analysis and modeling building techniques from an applied perspective. Theoretical principles will be demonstrated with real-world examples from biomedical studies. This course requires substantial statistical computing in software packages STATA and R; familiarity with at least one of these packages is required. The course covers regression modeling for continuous outcomes, including simple linear regression, multiple linear regression, and analysis of variance with one-way, two-way, three-way, and analysis of covariance models. This is a brief introduction to models for binary outcomes (logistic models), ordinal outcomes (proportional odds models), count outcomes (poisson/negative binomial models), and time to event outcomes (Kaplan-Meier curves, Cox proportional hazard modeling). Incorporated into the presentation of these models are subtopic topics such as regression diagnostics, nonparametric regression, splines, data reduction techniques, model validation, parametric bootstrapping, and a very brief introduction to methods for handling missing data. One hour lab required. Students are required to take 312L concurrently. Prerequisite: Biostatistics 311 or equivalent; familiarity with STATA and R software packages. SPRING. [3] Staff.

BIOS 312L. Modern Regression Analysis Lab. This is a discussion section/lab for Modern Regression Analysis. Students will review relevant theory and work on applications as a group. Computing solutions and extensions will be emphasized. Students are required to take 312 concurrently. SPRING. [1]

Cancer Biology

CANB 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.

CANB 325. Histology. 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]

CANB 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.

CANB 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.

CANB 344. Current Topics in Cancer Biology: Integrative Cancer Biology. This is a graduate-level course focusing on cancer as a complex biological system. The goal of this course is to provide the students with comprehensive and up-to-date knowledge about the dynamic and spatial interactions that exist among molecules in a cancer cell, between cancer cells and their "microenvironment," and between the organism and its "macroenvironment." This class will integrate multiple cutting-edge research approaches from several disciplines, including cancer biology, proteomics and bioinformatics, functional imaging, mathematical modeling and bioengineering, and epidemiology. Class will include both presentations by the instructors and discussion of recent publications by students. SPRING. [2] Lin.

CANB 345. Invasion, Motility and Metastasis. This course is focused on molecular and cell biological underpinnings of cancer cell migration, invasion, and metastasis. There are no prerequisites, but it is intended for graduate students with a strong foundation in experimental biology. Students in interdisciplinary fields such as engineering and mathematics are welcome (and encourage) to take the course if they already have some background biological knowledge, however it might be wise to talk with the instructor first. FALL [2]

CANB 346. Cancer Imaging. Spring [3] Yankeelov.

CANB 369. Master's Thesis Research. Master's Thesis Research

CANB 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

CANB 381. Molecular Foundations of Medicine. Molecular Foundations of Medicine is designed to familiarize students with the cellular structures, biomolecules, and processes that constitute life, human health, and disease at the molecular level. The course employs an integrated approach to teach underlying principles of biochemistry, cell and tissue biology, and genetics with an emphasis on human systems and medical conditions. The inclusion of clinical correlation sessions, small groups, and laboratory sessions will further integrate and broaden course material and relate molecular processes to the study of human disease. Prerequisite: MSTP students only. FALL. [1] Osheroff, George, Pettepher.

CANB 382. Structure, Function, and Development. Structure, Function, and Development is designed to provide students with the means to develop an effective understanding of the normal micro and macroscopic structure, function, and development of the human body. The course employs a coordinated, integrated approach to the presentation and learning of the disciplines of human gross anatomy, cell and tissue biology (histology), human development (embryology), and physiology in a context of clinical application. Prerequisite: MSTP students only. SPRING. [Variable credit: 1-10] Dalley, Strom, Pettepher.

CANB 383. Disease, Diagnoses, and Therapeutics. The objectives of this course are to teach the pathogenesis and manifestations of disease and to introduce the fundamentals of diagnosis and pharmacologic as well as nonpharmacologic therapy. Diseases, their recognition, and treatment are presented in a systems-based format using an interdisciplinary approach to allow integration of pathobiology, clinical diagnosis, and therapy in a comprehensive manner. Principles of pharmacologic therapy are presented in the context of relevant pathophysiology and how humans react to drug therapies. The course utilizes a variety of teaching modalities that include lectures, laboratory sessions focused on the gross and microscopic pathology of disease, and technology-based modalities that include computer-based lessons, as well as formats that promote critical thinking. The role of nutrition in disease prevention and management is also emphasized. The impact of disease and its treatment on public health and society as well as strategies for prevention are explored. Prerequisite: MSTP students only. SPRING. [Variable credit: 1-4] Atkinson, Murray, Awad.

CANB 399. Ph.D. Dissertation Research.

Cell and Developmental Biology

CBIO-GS 310. Cell Biology. This is a graduate-level course with three major goals pivotal for success as a graduate student: (1) To provide solid foundational knowledge of cell biology, (2) To learn to think critically about experimental design and interpretation, (3) To learn to communicate effectively, both orally and in writing. The class features faculty from the Department of Cell and Developmental Biology and emphasizes fundamental cell processes such as migration, mitosis, proliferation, and death. Critical signaling pathways are reviewed in relation to cell biological processes essential for developmental biology. Weekly student presentations help develop oral communication skills and weekly writing assignments hone writing skills, helping students learn classical and cutting-edge techniques while improving their ability to read and synthesize the literature. Final paper assignment is designed to help students learn to develop and design feasible experiments to test a strong hypothesis. Prerequisite: IGP curriculum, the entire Bioregulation class. FALL. [4] Labosky.

CBIO-GS 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.

CBIO-GS 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. [2] Tyska/Kaverina

CBIO-GS 320. Cancer and Development. (Also listed as CANB 320) 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.

CBIO-GS 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 by visiting scientists. During the course, ten 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.

CBIO-GS 325. Histology. (Also listed as Cancer 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. Offered every other year. FALL. [3] Bader.

CBIO-GS 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. Each area will be presented by four outside speakers (eight dates total). The week before each seminar, the student 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] L.Lee (fall); Gu (spring)

CBIO-GS 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.

CBIO-GS 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. [3] (Not currently offered)

CBIO-GS 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)

CBIO-GS 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] Hiebert (Biochemistry).

CBIO-GS 338. Special Topics 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. Prerequisite: Must be first year IGP student. [1] Gould.

CBIO-GS 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.

CBIO-GS 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. [Variable credit: 1-6] (Not currently offered)

CBIO-GS 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 to be selected. Offered every other year. SPRING. [Variable credit: 1-3] Wright.

CBIO-GS 342. Advanded 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)

CBIO-GS 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

CBIO-GS 347. The Visual System. (Also listed as Neuroscience 347, Psychology 336) 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 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

CBIO-GS 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.

CBIO-GS 350. Cell Microbiology of the Pathogen-Host Interaction. (Also listed as Microbiology and Immunology 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 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. (Not currently offered)

CBIO-GS 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

CBIO-GS 381. Molecular Foundations of Medicine. Molecular Foundations of Medicine is designed to familiarize students with the cellular structures, biomolecules, and processes that constitute life, human health, and disease at the molecular level. The course employs an integrated approach to teach underlying principles of biochemistry, cell and tissue biology, and genetics with an emphasis on human systems and medical conditions. The inclusion of clinical correlation sessions, small groups, and laboratory sessions will further integrate and broaden course material and relate molecular processes to the study of human disease. Prerequisite: MSTP students only. FALL. [Variable credit: 1-5] Osheroff, George, Pettepher.

CBIO-GS 382. Structure, Function and Development. Structure, Function, and Development is designed to provide students with the means to develop an effective understanding of the normal micro and macroscopic structure, function, and development of the human body. The course employs a coordinated, integrated approach to the presentation and learning of the disciplines of human gross anatomy, cell and tissue biology (histology), human development (embryology), and physiology in a context of clinical application. Prerequisite: MSTP students only. SPRING. [Variable credit: 1-10] Dalley, Strom, Pettepher

CBIO-GS 399. Ph.D. Dissertation Research.

Cellular and Molecular Pathology

PATH-GS 322. Experimental Methods In Pathology. Special techniques and preparations. Topics include electron microscopy, tissue culture, histochemistry, cytochemistry, and molecular biology. Admission to course, hours, and credit by arrangement. FALL, SPRING, SUMMER. [2-4] Abdulkadir and Staff.

PATH-GS 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.

PATH-GS 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] Swift.

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

PATH-GS 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.

PATH-GS 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.

PATH-GS 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.

PATH-GS 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.

PATH-GS 351A. 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.

PATH-GS 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.

PATH-GS 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

PATH-GS 383. Disease, Diagnoses, and Therapeutics. The objectives of this course are to teach the pathogenesis and manifestations of disease and to introduce the fundamentals of diagnosis and pharmacologic as well as nonpharmacologic therapy. Diseases, their recognition, and treatment are presented in a systems-based format using an interdisciplinary approach to allow integration of pathobiology, clinical diagnosis, and therapy in a comprehensive manner. Principles of pharmacologic therapy are presented in the context of relevant pathophysiology and how humans react to drug therapies. The course utilizes a variety of teaching modalities that include lectures, laboratory sessions focused on the gross and microscopic pathology of disease, and technology-based modalities that include computer-based lessons, as well as formats that promote critical thinking. The role of nutrition in disease prevention and management is also emphasized. The impact of disease and its treatment on public health

and society as well as strategies for prevention are explored. Prerequisite: MSTP students only. SPRING. [Variable credit: 1-10] Atkinson, Murray, Awad.

PATH-GS 399. Ph.D. Dissertation Research.

Chemical and Biomolecular Engineering

CHBE 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: ChBE 223. Graduate credit for non-majors. [3]

CHBE 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 non-majors. Prerequisite: Junior standing. Corequisite: Math 198. FALL. [3]

CHBE 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: ChBE 230. SPRING. [3]

CHBE 233W. Chemical Engineering Process and Product Design. A systematic approach to design and safety practices for chemical process operations. Process and product design, economic evaluation of alternatives, ethics, and a cost and safety analysis of a typical chemical, biological, or petroleum process and products. Process simulations required. Prerequisites: ChBE 223, 225, and 231. FALL. [3]

CHBE 234W. Chemical Engineering Design Projects. Team-based, semester-long design project. Evaluation through periodic oral and written presentations, a final written report, and a poster report. Senior standing. SPRING. [3]

CHBE 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 non-majors. Prerequisite: Math 198. FALL. [3]

CHBE 280. Atmospheric Pollution. (Also listed as ENVE 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. Prerequisite: junior standing. SPRING. [3]

CHBE 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 to models of commercial fermentations, biomass plants, and enzyme engineering. For graduate students and advanced undergraduates. Prerequisite: consent of instructor. [3]

CHBE 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, ChBE 225, ChBE 230. FALL [3].

CHBE 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]

CHBE 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: ChBE 162, ChBE 180, ChBE 223, or equivalents. [3]

CHBE 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 ChBE 162 or equivalents. [3]

CHBE 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: ChBE 162, a basic understanding of organic and physical chemistry. [3]

CHBE 290. Special Topics in Chemical Engineering. Prerequisite: consent of instructor. [3] (Offered on demand)

CHBE 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]

CHBE 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. FALL. [3]

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

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

CHBE 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]

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

CHBE 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, interface in composites, relationships of surface to bulk properties of materials. FALL. [3]

CHBE 369. Master's Thesis Research.

CHBE 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

CHBE 389. Master of Engineering Project. Master of Engineering Project

CHBE 397. Special Topics. Special Topics. [3]

CHBE 398. Seminar. Seminar. [0]

CHBE 399. Ph.D. Dissertation Research.

Chemical and Physical Biology

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

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

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

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

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

CPBP 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]

CPBP 399. Ph.D. Dissertation Research.

Chemistry

CHEM 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. Prerequisite: 218a-218b or 220a–220b. [3]

CHEM 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: Either 218b or 220b and either 230 or 231. [3]

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

CHEM 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 and either 218a-218b or 220a–220b. [3]

CHEM 211. Instrumental Analytical Chemistry. Chemical and physical principles of modern analytical chemistry instrumentation. Credit allowed for chemistry graduate students having deficiency. Prerequisite: 210 and either 218a-218b or 220a–220b. Must be accompanied by 212b for undergraduates. [3]

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

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

CHEM 220c. Organic Chemistry Structure and Mechanism. 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. Prerequisite: both 230 and 231 and either 218b or 220b. [4]

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

CHEM 223. Advanced Organic Reactions. A comprehensive study of organic reactions and their application to the preparation of small molecules. Prerequisite: 220c. Three lectures per week. [3]

CHEM 224. Bioorganic Chemistry. Essential metabolites including vitamins, steroids, peptides, and nucleotides. Consideration of phosphate esters and the synthesis of oligodeoxynucleotides. Prerequisite: 218a-218b or 220a–220b. Three lectures per week. [3]

CHEM 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: 218b or 220b. [3]

CHEM 226. Drug Design and Development. Concepts of drug design; 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. [3]

CHEM 231. Biophysical Chemistry: Thermodynamics in Chemical and Biological Systems. Chemical thermodynamics and equilibrium, their statistical foundation, and applications to chemical and biological phenomena in biomedical research. Prerequisite: MATH 150b or 155b and PHYS 116a–116b or 121a-121b. [3]

CHEM 235. Macromolecular Chemistry: Polymers, Dendrimers, and Surface Modifications. Synthesis and characterization of macromolecular materials including linear, branched, dendrimetric, and star polymers. Mechanical and physiochemical properties of polymeric types. Kinetics of living polymerization. Applications to nanostructures, templates, and advanced devices. Prerequisite: 102a-102b. [3]

CHEM 250. Chemical Literature. Assigned readings and problems in the nature and use of the chemical literature. Prerequisite: 218b or 220b. [1]

CHEM 301a. Chemistry Seminar. [1]

CHEM 301b. Chemistry Seminar. [1]

CHEM 304. Special Topics in Inorganic Chemistry. [3]

CHEM 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. [3]

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

CHEM 312. Electrochemistry: Theory and Analysis. [3]

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

CHEM 314a. Special Topics in Analytical Chemistry. [3]

CHEM 314b. Special Topics in Analytical Chemistry. [3]

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

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

CHEM 324. Special Topics in Organic Chemistry. [3]

CHEM 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]

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

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: 232. [3]

CHEM 332. Special Topics in Chemical Physics. [3]

CHEM 333. Molecular Modeling Methods. Computer simulation studies of molecules with emphasis on applications to biological molecules and complexes. Background theory, implementation details, capabilities and practical limitations. Prerequisite: 230 and 231. Includes one three-hour laboratory per week. Serves as repeat credit for students who completed 233 prior to fall 2010. [4]

CHEM 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]

CHEM 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. [3]

CHEM 337. Computational Structural Biochemistry. Theoretical and practical aspects of protein sequence alignments, secondary structure prediction, comparative modeling, protein-protein and protein-ligand docking. Structure-based drug design, virtual screening, quantitative structure activity relations, cheminformatics, and pharmacophore mapping in therapeutic development. Prerequisite: 231. Serves as repeat credit for students who completed 238 prior to fall 2010. [4]

CHEM 338. Quantum Chemistry. Limits of classical mechanics at the atomic and molecular level; postulates of quantum mechanics applied to problems in one, two, and three dimensions; perturbation and other methods. Prerequisite: 230 or equivalent. [3]

CHEM 339. Spectroscopy. Experimental and theoretical aspects of spectroscopy. Energy levels, selection rules, and spectral transitions related to atomic and molecular structure. Design of contemporary magnetic resonance and optical spectroscopy measurements. Prerequisite: 231. [3]

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

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. [3]

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

CHEM 369. Master's Thesis Research.

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

CHEM 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. [1–2]

CHEM 385. Advanced Reading in Chemistry. Specialized topics under the guidance of a departmental faculty member. Open to qualified graduate students only. [3]

CHEM 399. Ph.D. Dissertation Research.

Chinese

CHIN 201. Elementary Chinese. Introduction to Modern Chinese pronunciation, grammar, conversation, reading, and writing. [5]

CHIN 202. Elementary Chinese. Continuation of 201. Introduction to Modern Chinese pronunciation, grammar, conversation, reading, and writing. [5]

CHIN 214. Intermediate Chinese. Language training in oral and written Chinese. Prerequisite: 201–202. [5]

CHIN 216. Intermediate Chinese. Continuation of 214. Language training in oral and written Chinese. [5]

CHIN 231. Calligraphy. Basic skills of writing standard script kaishu. Basic aesthetic of Chinese calligraphy. No Chinese language background necessary. [1]

CHIN 241. Advanced Chinese. Readings in Chinese culture to enhance proficiency in oral and written Chinese. Prerequisite: 214–216. [3]

CHIN 242. Advanced Chinese. Continuation of 241. Readings in Chinese culture to enhance proficiency in oral and written Chinese. Prerequisite: 214–216. [3]

CHIN 251. Readings in Modern Chinese Media. Books, newspapers, Internet, and television documents and productions pertaining to political, social, and economic issues in China, including foreign trade-related issues. Prerequisite: 242. [3]

CHIN 252. Readings in Modern Chinese Media. Continuation of 251. Books, newspapers, Internet, and television documents and productions pertaining to political, social, and economic issues in China, including foreign trade-related issues. Prerequisite: 242. [3]

CHIN 255. Business Chinese. Language skills for listening, speaking, reading, and writing in business environments. Modern China from economic and business perspectives. Prerequisite: 242. [3]

CHIN 256. Business Chinese. Continuation of 255. Language skills for listening, speaking, reading, and writing in business environments. Modern China from economic and business perspectives. Prerequisite: 242. [3]

CHIN 289a. Independent Study. A reading course, the content of which varies according to the needs of the individual student. Primarily designed to cover pertinent material not otherwise available to the student in the regular curriculum. [Variable credit: 1–3 each semester, maximum of 12 hours over a four-semester period in 289a and 289b combined]

CHIN 289b. Independent Study. A reading course, the content of which varies according to the needs of the individual student. Primarily designed to cover pertinent material not otherwise available to the student in the regular curriculum. [Variable credit: 1–3 each semester, maximum of 12 hours over a four-semester period in 289a and 289b combined]

Civil Engineering

CE 251. Foundation Analysis and Design. Study of shallow and deep foundation elements and systems for civil engineering structures. Soil exploration and site investigation. Prerequisite: CE 240 or equivalent. SPRING. [3]

CE 252A. 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]

CE 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]

CE 255. Transportation System Design. Geometric analysis of transportation ways with particular emphasis on horizontal and vertical curve alignment. Design of highways, interchanges, intersections, and facilities for air, rail, and public transportation. Prerequisite: CE 225, junior standing. SPRING. [3]

CE 256. Urban Transportation Planning. Analytical methods and the decision-making process. Transportation studies, travel characteristic analysis, and land-use implications are applied to surface transportation systems. Emphasis is on trip generation, trip distribution, modal split, and traffic assignment. Computerized planning programs are used. Prerequisite: CE 225, junior standing. SPRING. [3]

CE 257. Traffic Engineering. Traffic Engineering. Analysis of the characteristics of traffic, including the driver, vehicle, volumes, speeds, capacities, roadway conditions, and accidents. Traffic regulation, control, signing, signalization, and safety programs are also discussed. Prerequisite: CE 225. FALL. [3]

CE 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. Includes GIS?software utilization and individual projects. SPRING. [3]

CE 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. SPRING. [3]

CE 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]

CE 287. Construction Estimating. 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]

CE 288. Construction Planning and Scheduling. 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]

CE 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]

CE 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]

CE 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: CE 286. SPRING. [3]

CE 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 such as multistory buildings including computer applications. Prerequisite: CE 235. FALL. [3]

CE 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: CE 235. SPRING. [3]

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]

CE 298. Building Systems and LEED. Design and construction of mechanical, electrical, plumbing, and telecommunications systems in buildings. Leadership in Energy and Environmental Design (LEED) green Building Rating System(TM) building approach to sustainability. Prerequisite: senior standing. SPRING. [3]

CE 299. Special Topics. Special Topics [3]

CE 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: CE 182 or equivalent, Math 198 or equivalent, Math 194 or equivalent, or consent of instructor. FALL. [3]

CE 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, axi-symmetric, and slip line problems. Prerequisite: CE 301 or consent of instructor. SPRING. [3]

CE 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-Co 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]

CE 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 (second-order and higher) problems. Multi-disciplinary problems. Error estimation and adaptive model improvement. Introduction to multi-scale modeling and atomistic/continuum coupling. Prerequisite: CE 307 or equivalent. SPRING. [3]

CE 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 nonlinear dynamic analysis. Application 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]

CE 310. Probabilistic Methods in Engineering Design. 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. Prerequisite: Math 194. FALL. [3]

CE 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 or CE 310. [3]

CE 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: CE 310. SPRING. [3]

CE 317. Stability of Structures. Buckling analysis of perfect and imperfect columns, mathematical treatment of various stability criteria, dynamic and static instability, energy methods. Buckling of frames, trusses, beam-columns, rings, and tubes. [3]

CE 318. Prestressed Concrete. Behavior and design of statically determinate prestressed concrete structures under bending moment, shear, torsion, and axial load effects. Design of statically determinate 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: CE 235 or equivalent. [3]

CE 325A. Individual Study of Civil Engineering Problems. Literature review and analysis of special problems under faculty supervision. FALL, SPRING, SUMMER. [1-4 each semester]

CE 325B. Individual Study of Civil Engineering Problems. Literature review and analysis of special problems under faculty supervision. FALL, SPRING, SUMMER. [1-4 each semester]

CE 325C. Individual Study of Civil Engineering Problems. Literature review and analysis of special problems under faculty supervision. FALL, SPRING, SUMMER. [1-4 each semester]

CE 351. Public Transportation Systems. Comprehensive study of public transportation, with emphasis on planning, management, and operations; paratransit, ridesharing, and rural public transportation systems. Prerequisite: CE 256. SPRING. [3]

CE 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: CE 225 or consent of instructor. [3]

CE 355. Advanced Transportation Design. An in-depth view of the design process. Complex design problems and solutions, with the use of computer-based analytical and design tools. Comprehensive design projects. Prerequisite: CE 255. SPRING. [3]

CE 356. Advanced Transportation Planning. A continuation of the concepts from CE 256, with emphasis on analytical techniques used in forecasting travel. Use of computer-based models, transportation and energy contingency planning methods. Prerequisite: CE 256. SPRING. [3]

CE 357. Theory of Traffic Flow. A study of 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: CE 257. [3]

CE 359. Emerging Information Systems Applications. 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 transportation or manufacturing operations or consent of instructor. FALL. [3]

CE 369. Master's Thesis Research.

CE 371A. Reliability and Risk Engineering Seminar. Seminars by expert speakers will provide a wide range of perspectives on reliability and risk assessment and management of multi-disciplinary 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]

CE 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]

CE 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

CE 389. Master of Engineering Project. Master of Engineering Project

CE 399. Ph.D. Dissertation Research.

Classics

CLAS 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. Serves as repeat credit for students who have completed HART 257. [3]

CLAS 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) that develop significantly in this period. Serves as repeat credit for students who have completed HART 258. [3]

CLAS 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. Serves as repeat credit for students who have completed HART 260. [3]

CLAS 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]

CLAS 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]

CLAS 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]

CLAS 211. The Greek City. The example of ancient Athens. The stoa, the theatre, the house, and fortifications. Institutions such as the courts, the public assembly, and the family. Literary, historical, archaeological, and philosophical sources. Serves as repeat credit for students who have completed HART 263. [3]

CLAS 212. History of the Roman Republic. 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. [3]

CLAS 213. History of the Roman Empire. 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. [3]

CLAS 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 roles, demography and family structure, marriage, children, religion, domestic architecture and the household economy, ancient critiques of the family, and the impact of Christianity. [3]

CLAS 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]

CLAS 224. The 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]

CLAS 225. Humor, Ancient to Modern. Ancient comic forms juxtaposed with modern theories of humor. Aristophanic Old Comedy, New Comedy, and Satire. Modern parallels. [3]

CLAS 231. Akkadian. 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). [3]

CLAS 232. Akkadian. Continuation of 231. 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). [3]

CLAS 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.). Discussion of political histories, and the social, religious, and intellectual heritage of Mesopotamia, Egypt, and Anatolia through excavated artifacts and written documents. [3]

CLAS 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 Thutmoses III, Suppiluliumas, Ramses II, and the spiritually influential Akehnaten. [3]

CLAS 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. [3]

CLAS 243. Alexander the Great. Alexander's rise to power and conquests in Europe, Asia, and Africa; the legacy of his introduction of Greek culture to the East; his significance to later audiences. [3]

CLAS 260. Roman Law. The relationship between law and society as illustrated by cases drawn from Roman legal and literary sources. The development of legal reasoning and the rise of an autonomous legal profession at Rome. [3]

CLAS 295. Periclean Athens. Ancient Athens in the age of Pericles. Literature, history, art, architecture, and archaeological evidence. Intended for senior majors. [3]

CLAS 296W. Augustan Rome. Social, administrative, religious, and military reforms. Common themes in art, architecture, and literature; changes in national identity in the transition from Republic to Empire. Intended for senior majors. [3]

CLAS 305. Seminar in Classical Art and Architecture. May be repeated for credit with change of subject matter. [3]

CLAS 309. Seminar: Studies in Ancient History. May be repeated for credit with change of subject matter. [3]

CLAS 355. Seminar in Classics. [3]

CLAS 369. Master's Thesis Research. [0]

CLAS 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. [Variable credit: 1–3]

Community Research and Action

HOD 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]

HOD 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. [3]

HOD 3450. Ethnographic Research Methods in Communities. Through empirical data collection on human behavior in communities, ethnography and other qualitative research methods build hypotheses and theory grounded in the values, beliefs, and aspirations of different societies and cultures. This course introduces and explores the tools and techniques of ethnography and their uses in (1) research problem conceptualization, delineation of assumptions, and generation of culturally competent hypotheses and (2) identification and construction of data sets, field research to collect data, and theory building and practical application derived from data analysis. The course is explicitly interdisciplinary. [3]

HOD 3460. Fieldschool in Intercultural Education. This course takes place in a community other than one's own either domestically or internationally over a 10-week period in the summer session. It provides training in community field research and analysis techniques directed to human, social, and civic development issues. [3]

HOD 3470. Community Psychology. 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. [3]

HOD 3600. Community Development and Urban Policy. 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. [3]

HOD 3610. Development Project Design and Evaluation. 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]

HOD 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]

HOD 3640. Global Dimensions of Community Development. The globalization process induces new forms of human organization and transforms existing organizations at the community, national, and international levels. This course provides an understanding of the nature, functioning, and development of organizations affected by globalization in societies dif-

ferent from our own and as they relate to multilateral or global institutions that span different social and cultural settings. To do this, the course explores organizations from a comparative perspective, using the analytical framework of human ecology, in terms of differential access to economic and other productive assets, education and information, security and the rule of law, social capital and cultural identity. [3]

HOD 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. 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]

HOD 3690. Master's Thesis Research. Open to Graduate School students only. [3]

HOD 3790. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

HOD 3870. Thesis Development Seminar. The purpose of course is to help students plan empirical theses. Students must register for both Fall and Spring semesters in that order. Fall will be devoted to the identification of a tentative topic or area of study. Spring will be devoted to developing a draft thesis proposal, including a presentation of the problem, a critical literature review, research questions, a draft methods and approach to data analysis sections. [1-3]

HOD 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. [1-6]

HOD 3930. Readings and Research. [1-6]

HOD 3960. Special Topics. May be repeated with a change in topic. [1-4]

HOD 3990. Ph.D. Dissertation Research. Variable credit [0-12]

HOD 3995. Half-time Ph.D Dissertation Research. For students who have completed 72 hoursand devote a half-timeeffort to dissertation research. [0]

Computer Science

CS 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: CS 201; corequisite: EECE 116/116L. FALL, SPRING. [3]

CS 250. Algorithms. Advanced data structures, systematic study and analysis of important algorithms for searching; sorting; string processing; mathematical, geometrical, and graph algorithms, classes of P and NP, NP-complete and intractable problems. Prerequisite: CS 201 and CS 212. FALL, SPRING. [3]

CS 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: CS 201. FALL, SPRING [3]

CS 252. Theory of Automata, Formal Languages, and Computation. Finite-state machines and regular expressions. Context-free grammars and languages. Pushdown automata. Turing machines. Undecideability. The Chomsky hierarchy. Computational complexity. Prerequisite: CS 212. SPRING. [3]

CS 253. Image Processing. (Also listed as EECE 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]

CS 255. Introduction to Numerical Mathematics. (Also listed as Math 226) Numerical solution of linear and nonlinear equations, interpolation, and polynomial 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]

CS 257. Linear Optimization. (Also listed as Math 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]

CS 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, CS 201, junior standing. FALL. [3]

CS 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: CS 201, Linear Algebra. SPRING. [3]

CS 260. Artificial Intelligence. Introduction to the principles and programming techniques of artificial intelligence. Strategies for searching, representation of knowledge and automatic deduction, learning, and adaptive systems. Survey of applications. Prerequisite: CS 250 and CS 270 or consent of instructor. FALL. [3]

CS 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: CS 201. FALL. [3]

CS 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: CS 260 or consent of instructor. SPRING. [3]

CS 270. Programming Languages. General criteria for design, implementation, and evaluation of programming languages. Historical perspective. Syntactic and semantic specification, compilations, and interpretation processes. Comparative studies 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: CS 231. FALL, SPRING. [3]

CS 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 Math 198, Math 216 or Math 218. SPRING. [3]

CS 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: CS 231. FALL. [3]

CS 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: CS 270 or senior standing in Computer Science or Computer Engineering. FALL. [3]

CS 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: CS 278. SPRING. [3]

CS 281. Principles of Operating Systems I. Overview of goals of operating systems. Introduction to the resource allocation and control functions of operating systems. Scheduling of processes and processors. Concurrent processes and primitives for their synchronization. Use of parallel processes in designing operating system subsystems. Methods of 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: CS 231. FALL, SPRING. [3]

CS 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. Resource 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: CS 281. SPRING. [3]

CS 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: CS 281. SPRING. [3]

CS 284. Computer Systems Analysis. Techniques for evaluating computer system performance with emphasis upon application. Topics include measurement and instrumentation techniques, benchmarking, simulation techniques, elementary queuing models, data analysis, operation analysis, performance criteria, case studies. Project involving a real computer system. Prerequisite: CS 281. SPRING. [3]

CS 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: CS 283. FALL. [3]

CS 291. Special Topics. [Variable credit: 1-3 each semester] (Offered on demand)

CS 292. Special Topics. [Variable credit: 1-3 each semester] (Offered on demand)

CS 310. Design and Analysis of Algorithms. Set manipulation techniques, divide-and-conquer methods, the greedy method, dynamic programming, algorithms on graphs, backtracking, branch-and-bound, lower bound theory, NP-hard and NP-complete problems, approximation algorithms. Prerequisite: CS 250. SPRING. [3]

CS 311. Graph Algorithms. Algorithms for dealing with special classes of graphs. Particular emphasis is given to subclasses of perfect graphs and graphs that can be stored in a small amount of space. Interval, chordal, permutation, comparability, and circular-arc graphs; graph decomposition. Prerequisite: CS 310 or Math 275. [3]

CS 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]

CS 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: CS 310 or consent of instructor. [3]

CS 343. High-Performance Computing for Engineers. (Also listed as ME 343) Introduction to high-performance computing. Engineering applications. Focus on high-speed cluster computing. Class project applying high-performance computing to various research topics. Prerequisite: Introductory programming class or consent of instructor. FALL. [3]

CS 350. Artificial Neural Networks. 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]

CS 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]

CS 352. Human-Computer Interaction. An overview of human computer interaction and problems of current interest. Topics include: 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]

CS 357. Advanced Image Processing. (Also listed as EECE 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]

CS 358. Computer Vision. (Also listed as EECE 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: CS 357 or EECE 357. SPRING. [3]

CS 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]

CS 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: CS 260 or equivalent. FALL. [3]

CS 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: CS 260, CS 360, or equivalent. SPRING. [3]

CS 364. Intelligent Learning Environments. (Also listed as EECE 355) 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]

CS 366. Distributed Artificial Intelligence. Principles and practice of multiple agent systems for distributed artificial intelligence. Game theory, distributed negotiation and decision making, distributed problem solving, cooperation, coalition formation and distributed learning. Prerequisite: CS 260. SPRING. [3]

CS 369. Master's Thesis Research.

CS 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]

CS 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]

CS 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]

CS 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit 0-12]

CS 381. Advanced Operating Systems Principles. Techniques for formally analyzing various issues in operating systems. Includes process synchronization, interprocess communication, deadlock, naming, memory management, objective capability-models, architectural support, protection, fault tolerance. Prerequisite: CS 281. FALL. [3]

CS 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: CS 281 or CS 381. SPRING. [3]

CS 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: CS 278. FALL. [3]

CS 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: CS 381 or consent of instructor. SPRING. [3]

CS 387. Topics in Software Engineering. Topics may include empirical software engineering and open-source software engineering. Prerequisite: CS 278 or consent of instructor. SPRING. [3]

CS 388. Model-Integrated Computing. Model-Integrated Computing 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]

CS 389. Master of Engineering Project.

CS 390. Individual Studies. Offered each term. [1-3]

CS 391. Seminar. [1-3 each semester]

CS 392. Seminar. [1-3 each semester]

CS 395. Special Topics. Special Topics [3]

CS 396. Special Topics. Special Topics [3]

CS 399. Ph.D. Dissertation Research.

CS 3995. Half-time Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

Earth and Environmental Sciences

EES 201. Global Climate Change. Science and policy of global climate change: history and causes of climate change in Earth's past, with emphasis on the last 2 million years; evidence of human impacts on climate since 1850; future climate change and its economic, social, and ecological consequences; economic, technological, and public policy responses. Prerequisite: 101 or 108. [3]

EES 220W. Life Through Time. Ecology, classification, and evolution 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 BSCI 100 or BSCI 110b. [4]

EES 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 per week. Prerequisite: 101. [4]

EES 255. Transport Processes in Earth and Environmental Systems. Principles of conservation and constitutive transport laws; classic and emerging styles of modeling natural systems. Prerequisite: physics and calculus; senior or graduate standing in Earth and Environmental Sciences or related fields. [3]

EES 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. [3]

EES 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. [3]

EES 262. Geochemistry Laboratory. Laboratory to accompany 258 or 260. Corequisite: 258 or 260. One three-hour laboratory per week. [1]

EES 272. Early Earth Systems. The first three billion years of the earth's history. Evidence and techniques used to reconstruct the origin and evolution of the earth and its mantle, crust, atmosphere, oceans, and life. Geochemical applications, isotopes, and geochronology. Prerequisite: 226. [3]

EES 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: 220W and 226. [3]

EES 285. Volcanic Processes. Nature, behavior, and origin of volcanoes. Magmatic processes that lead to eruptions. Eruptive processes and

volcano construction. Impacts of volcanism on Earth's surface environment. Prerequisite: 226. [3]

EES 291a. 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. [Variable credit: 2–3 each semester]

EES 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. [Variable credit: 2–3 each semester]

EES 320. Aqueous Geochemistry. The chemistry of subsurface waters, including near-surface groundwaters, oreforming 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. [3]

EES 369. Master's Thesis Research.

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

EES 390. Special Topics and Advanced Techniques in Geology. [Variable credit: 1-4]

Economics

ECON 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. Prerequisite: 100 and 101. [3]

ECON 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 and 231, or consent of instructor. Prerequisite: 100 and 101. [3]

ECON 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]

ECON 255. Social Choice Theory. Strategic and non-strategic social choice theory. Preference aggregation, formal models of voting, and matching. Prerequisite: 231 or PHIL 202 or any Mathematics course numbered 200 or above. [3]

ECON 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 and 232. [3]

ECON 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]

ECON 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]

ECON 264. Open Economy Macroeconomics. Economics of international monetary, financial, and macroeconomic relationships. Effects of monetary and fiscal politics in open economics, balance of payments, exchange rate determination, and international monetary institutions. Prerequisite: 232. [3]

ECON 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]

ECON 266. Topics in the Economic History of the U.S.. Analysis of major issues and debates in American economic history. Prerequisite: 231. [3]

ECON 267. Poverty and Discrimination. Theories and empirical evidence concerning inequality, poverty, and discrimination, and their relationship to economic growth. Evaluation of anti-poverty and anti-discrimination policies. Prerequisite: 150 and 231. [3]

ECON 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]

ECON 269a. Selected Topics in Economics. Topics of special interest. Prerequisite: 100 and 101. [Variable credit: 1–3 each semester]

ECON 269b. Selected Topics in Economics. Topics of special interest. Prerequisite: 100 and 101. [Variable credit: 1–3 each semester]

ECON 270. Sports Economics. Intercollegiate and professional sports leagues: competitive balance, player labor markets, and owner capital markets. Theories of league expansion, rival leagues, franchise relocation, and sports venue finance. International sports league comparisons. No credit for students who have completed 280. Prerequisites: 150 or equivalent and 231. [3]

ECON 271. Economic History of Europe. Sources of western European economic progress. Organization of medieval agriculture, growth of overseas merchant empires, origins of the Industrial Revolution, and the role of property rights. Prerequisite: 231. [3]

ECON 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]

ECON 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]

ECON 279. Urban Economics. Urban growth, development of suburbs, location of firms, housing markets, transportation, property taxes, and local government services. Prerequisite: 231. [3]

ECON 280. Seminar in Sports Economics. Economic theory of professional sports leagues: competitive balance, player labor markets, and owner capital markets. Theories of league expansion, rival leagues, franchise relocation, and sports venue finance. Research paper required. Preference given to senior majors. No credit for students who have completed 270. Prerequisites: 150 or equivalent and 231. [3]

ECON 284. Topics in Econometrics. Emphasis on applications. May include generalized method of moments, empirical likelihood, resampling methods, and nonparametric techniques. Prerequisite: 253. [3]

ECON 285. Law and Economics. Analysis of the influence of legal rules and institutions on the behavior of individuals and economic efficiency and equity. Applications from civil procedure, contract, tort, and criminal law. Prerequisite: 231. [3]

ECON 288. Development Economics. Determinants of national economic growth for pre-industrial and newly industrial countries. Inequality and poverty. Imperfect credit markets and microfinance. Political con-

straints and corruption. Policy issues relevant to developing economics. Prerequisite: 150 and 231. [3]

ECON 300. Selected Topics in Mathematics for Economists. Mathematics used in the analysis of static and dynamic models. Prerequisite: Open to students of the Economics Ph.D., Law and Economics Ph.D., and Finance Ph.D. programs, or by consent of the instructor and Economics Director of Graduate Studies. [3]

ECON 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]

ECON 302. Macroeconomic Theory (M.A. Level). National income accounting. Theories of income, employment and price determination. Growth and planning models. Monetary theory. [3]

ECON 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. Prerequisite: Open to Economics Ph.D., Law and Economics Ph.D., and Finance Ph.D. programs, or by consent of the instructor and the Economics Director of Graduate Studies. [3]

ECON 304b. Microeconomic Theory II. Noncooperative game theory, information economics, public goods. Topics include Nash equilibrium, sequential rationality, incomplete information; oligopoly; bargaining; adverse selection, signaling and screening; principal-agent models; externalities and public goods. Prerequisite: 304a or consent of the instructor and the Economics Director of Graduate Studies. [3]

ECON 304c. Microeconomic Theory III. General equilibrium, social choice, and welfare economics. 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. Prerequisite: 304a and 304b, or consent of instructor and the Economics Director of Graduate Studies. [3]

ECON 305a. Macroeconomic Theory I. Keynesian and neoclassical models of the economy. Introduction to dynamic models. Prerequisite: Open to students of the Economics Ph.D., Law and Economics Ph.D., and Finance Ph.D. programs, or by consent of the instructor and Economics Director of Graduate Studies. [3]

ECON 305b. Macroeconomic Theory II. Neoclassical and new theories of economic growth. Overlapping generations models. Prerequisite: 305a or consent of the instructor and Economics Director of Graduate Studies. [3]

ECON 305c. Macroeconomic Theory III. Theories of consumption, investment, demand and supply of money, the labor market, monetary and fiscal policy, and New Keynesian economics. Prerequisite: 305a and 305b or consent of the instructor and Economics Director of Graduate Studies. [3]

ECON 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]

ECON 307. Statistical Analysis. Statistical methods applicable to quantitative research in economics. Distribution theory, statistical inference, and selected multivariate statistical methods. Prerequisite: Open to students of the Economics Ph.D., Law and Economics Ph.D., and Finance Ph.D. programs, or by consent of the instructor and Economics Director of Graduate Studies. [3]

ECON 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]

ECON 309a. Econometrics I. 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 and Economics Director of Graduate Studies. [3]

ECON 309b. Econometrics II. Identification and estimation of simultaneous equation models. Small sample properties of estimators and Bayesian inference. Model building and testing of economic theory. Prerequisite: 309a or consent of instructor and Economics Director of Graduate Studies. [3]

ECON 312a. 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]

ECON 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]

ECON 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]

ECON 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]

ECON 320a. 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]

ECON 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]

ECON 329a. 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]

ECON 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]

ECON 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]

ECON 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]

ECON 333. Topics in Microeconomics. Advanced theory and applications. May be repeated for credit if there is no duplication of topic. [Variable credit: 1–3]

ECON 349a. 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]

ECON 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. [1–3]

ECON 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]

ECON 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]

ECON 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]

ECON 355a. 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 355a and 355b with an average grade of B counts in lieu of M.A. thesis. Open only to students in the Economic Development program. [3]

ECON 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 355a and 355b with an average grade of B counts in lieu of M.A. thesis. Open only to students in the Economic Development program. [3]

ECON 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]

ECON 358a. Special Topics in Development Policies. Selected topics in the economic analysis of problems in developing countries. May be repeated for credit if there is no duplication in topic. [3]

ECON 358b. Special Topics in Development Policies. Selected topics in the economic analysis of problems in developing countries. May be repeated for credit if there is no duplication in topic. [3]

ECON 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]

ECON 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]

ECON 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]

ECON 369. Master's Thesis Research. [0–12]

ECON 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]

ECON 373. Time Series Econometrics. Estimation of stationary ARMA models, analysis of nonstationary 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]

ECON 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]

ECON 375. Topics in Advanced Econometrics. Advanced theory and applications. May be repeated for credit once if there is no duplication of topic. [1–3]

ECON 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]

ECON 379. Non-candidate Research. [Variable credit: 0–12]

ECON 388a. 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: 304a, 304b, 305a, and 305b. [3]

ECON 388b. 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: 304a, 304b, 305a, and 305b. [3]

ECON 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]

ECON 399. Ph.D. Dissertation Research.

ECON 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

EECE 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]

EECE 218L. Microcontrollers Laboratory. Laboratory for EECE 218. A small structured project is required. One three-hour laboratory per week. Corequisite: EECE 218. SPRING. [1]

EECE 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]

EECE 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 112. Corequisite: EECE 235L. FALL. [3]

EECE 235L. Electronics I Laboratory. Laboratory for EECE 235. One three-hour laboratory per week. Corequisite: EECE 235. FALL. [1]

EECE 252. Signal Processing and Communications. AM and FM modulation. Also, advanced topics in signal processing are treated. Prerequisite: EECE 214. SPRING. [3]

EECE 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]

EECE 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]

EECE 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]

EECE 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]

EECE 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]

EECE 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].

EECE 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]

EECE 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]

EECE 267. Power System Analysis. 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]

EECE 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]

EECE 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. Prerequisite: EECE 218. Corequisite: EECE 276L. FALL. [3]

EECE 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]

EECE 277. FPGA Design. Design and applications of field-programmable gate arrays, Electronic Design Automation (EDA) tools for design, placement, and routing. Hardware description languages. Implementation of designs on prototype FPGA board. A project is required. Prerequisite: EECE 116, EECE 218. SPRING. [3]

EECE 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]

EECE 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]

EECE 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]

EECE 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]

EECE 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]

EECE 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]

EECE 288. Optoelectronics. Fundamentals and applications of light generation, propagation, and modulation in passive and active optoelectronic components. Waveguides, lasers, electro-optic modulators, and emerging optoelectronic technology for optical communication, computing, and sensing applications. Prerequisite: EECE 233 or equivalent. SPRING. [3]

EECE 291. Special Topics. [Variable credit: 1-3 each semester]

EECE 292. Special Topics. [Variable credit: 1-3 each semester]

EECE 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]

EECE 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]

EECE 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]

EECE 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]

EECE 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]

EECE 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]

EECE 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]

EECE 307. Solid-State Effects and Devices II. The structure of solids, phonons, band theory, scattering phenomena, and theory of insulators. [3]

EECE 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]

EECE 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 (0r equivalent). SPRING. [3]

EECE 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]

EECE 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]

EECE 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]

EECE 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]

EECE 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]

EECE 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]

EECE 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]

EECE 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]

EECE 362. Detection and Estimation Theory. Fundamental aspects of signal detection and estimation. Formulation of maximum likelihood, maximum aposteriori, and other criteria. Multidimensional probability theory, signal and noise problems, and Kalman filter structure are studied. SPRING. [3]

EECE 369. Master's Thesis Research.

EECE 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit 0-12]

EECE 389. Master of Engineering Project.

EECE 391. Seminar. Seminar. [1]

EECE 392. Seminar. Seminar. [1]

EECE 393. Advanced Seminar for Ph.D. Candidates. Advanced Seminar for Ph.D. Candidates. [1]

EECE 394. Advanced Seminar for Ph.D. Candidates. Advanced Seminar for Ph.D. Candidates. [1]

EECE 395. Special Topics. Based on research and current developments in electrical engineering of special interest to staff and students. [3]

EECE 396. Special Topics. Based on research and current developments in electrical engineering of special interest to staff and students. [3]

EECE 397. 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]

EECE 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]

EECE 399. Ph.D. Dissertation Research.

Engineering Management

ENGM 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. Junior standing. FALL, SPRING, SUMMER. [3]

ENGM 253. Technology-Based Entrepreneurship. Identification and evaluation of opportunities: risks faced by entrepreneurs, market assessment, capital requirements, venture capital acquisition, legal structures, tax implications for sharing technology-based businesses. Prerequisite: ENGM 221 and junior standing. FALL [3]

ENGM 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 221 and junior standing; ENGM 273 strongly recommended. FALL. [3]

ENGM 273. Systems Engineering. 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: ENGM 221, basics of probability and statistics and engineering systems. Required for the ENGM minor. Junior standing. FALL, SPRING, [3]

ENGM 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. Required for ENGM minor. Prerequisite: ENGM 221 and junior standing. FALL, SPRING. [3]

ENGM 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. Prerequisite: Junior standing. Technology-society elective. SPRING. [3]

ENGM 290A. Independent Study. Readings or projects on topics in engineering management under the supervision of the ENGM faculty. Consent of instructor required. No more than 6 hours may be applied toward graduation. FALL, SPRING. [Variable credit: 1-3 each semester]

ENGM 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.

ENGM 291. Special Topics. [Variable credit 1-3 each semester]

ENGM 292. Special Topics. [Variable credit: 1-3 each semester]

English

ENGL 232a. 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, Bellow, Kingston, Morrison, Pynchon. Emphasizes writers before 1945. [3]

ENGL 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, Bellow, Kingston, Morrison, Pynchon. Emphasizes writers after 1945. [3]

ENGL 268a. America on Film: Art and Ideology. American culture and character through film, film theory, and literature. [3]

ENGL 288. Special Topics in English and American Literature. Topics vary. [3]

ENGL 288W. Special Topics in English and American Literature. Topics vary. [3]

ENGL 301. Seminar in Middle English Literature. [4]

ENGL 302. Seminar in Chaucer. [4]

ENGL 303. Graduate Fiction Workshop. [May be repeated for credit with the program director's approval] [4]

ENGL 304. Graduate Poetry Workshop. [May be repeated for credit with the program director's approval] [4]

ENGL 305. Graduate Nonfiction Workshop. [May be repeated for credit with the program director's approval] [4]

ENGL 306. Seminar in Sixteenth-Century Literature. [4]

ENGL 307. Literature and the Craft of Writing. [May be repeated for credit with the program director's approval] [4]

ENGL 310. Seminar in Shakespeare. [4]

ENGL 312. Seminar in Seventeenth-Century Literature. [4]

ENGL 314. Seminar, 1660–1800. [4]

ENGL 316. Seminar in Romantic Prose and Poetry. [4]

ENGL 318. Seminar in Victorian Prose and Poetry. [4]

ENGL 320. Studies in American Literature. [4]

ENGL 321. Studies in Southern Literature. [4]

ENGL 325. Seminar in Modern British and American Literature. [4]

ENGL 326. Introduction to Literary Modernism. [4]

ENGL 330. Seminar in the Enlightenment and Its Literary Connections. [4]

ENGL 337a. Introduction to Literary Theory. [4]

ENGL 337b. Introduction to Literary Theory. [4]

ENGL 350. Special Problems in English and American Literature. May be repeated. [Variable credit: 1–4]

ENGL 355. Special Topics in English and American Literature. [4]

ENGL 369. Master's Thesis Research.

ENGL 370. Master of Fine Arts Thesis Research. [8]

ENGL 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]

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

ENGL 399. Ph.D. Dissertation Research.

ENGL 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

CE 251. Foundation Analysis and Design. Study of shallow and deep foundation elements and systems for civil engineering structures. Soil exploration and site investigation. Prerequisite: CE 240 or equivalent. SPRING. [3]

CE 252A. 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]

CE 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]

CE 255. Transportation System Design. Geometric analysis of transportation ways with particular emphasis on horizontal and vertical curve alignment. Design of highways, interchanges, intersections, and facilities for air, rail, and public transportation. Prerequisite: CE 225, junior standing. SPRING. [3]

CE 256. Urban Transportation Planning. Analytical methods and the decision-making process. Transportation studies, travel characteristic analysis, and land-use implications are applied to surface transportation systems. Emphasis is on trip generation, trip distribution, modal split, and traffic assignment. Computerized planning programs are used. Prerequisite: CE 225, junior standing. SPRING. [3]

CE 257. Traffic Engineering. Traffic Engineering. Analysis of the characteristics of traffic, including the driver, vehicle, volumes, speeds, capacities, roadway conditions, and accidents. Traffic regulation, control, signing, signalization, and safety programs are also discussed. Prerequisite: CE 225. FALL. [3]

CE 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. Includes GIS?software utilization and individual projects. SPRING. [3]

CE 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. SPRING. [3]

CE 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]

CE 287. Construction Estimating. 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]

CE 288. Construction Planning and Scheduling. 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]

CE 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]

CE 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 lifecycle assessment. Prerequisite: senior standing. SUMMER. [3]

CE 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: CE 286. SPRING. [3]

CE 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 such as multistory buildings including computer applications. Prerequisite: CE 235. FALL. [3]

CE 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: CE 235. SPRING. [3]

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]

CE 298. Building Systems and LEED. Design and construction of mechanical, electrical, plumbing, and telecommunications systems in buildings. Leadership in Energy and Environmental Design (LEED) green Building Rating System(TM) building approach to sustainability. Prerequisite: senior standing. SPRING. [3]

CE 299. Special Topics. Special Topics [3]

CE 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: CE 182 or equivalent, Math 198 or equivalent, Math 194 or equivalent, or consent of instructor. FALL. [3]

CE 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, axi-symmetric, and slip line problems. Prerequisite: CE 301 or consent of instructor. SPRING. [3]

CE 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-Co 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]

CE 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 (second-order and higher) problems. Multi-disciplinary problems. Error estimation and adaptive model improvement. Introduction to multi-scale modeling and atomistic/continuum coupling. Prerequisite: CE 307 or equivalent. SPRING. [3]

CE 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 nonlinear dynamic analysis. Application 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]

CE 310. Probabilistic Methods in Engineering Design. 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. Prerequisite: Math 194. FALL. [3]

CE 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 or CE 310. [3]

CE 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: CE 310. SPRING. [3]

CE 317. Stability of Structures. Buckling analysis of perfect and imperfect columns, mathematical treatment of various stability criteria, dynamic and static instability, energy methods. Buckling of frames, trusses, beam-columns, rings, and tubes. [3]

CE 318. Prestressed Concrete. Behavior and design of statically determinate prestressed concrete structures under bending moment, shear, torsion, and axial load effects. Design of statically determinate 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: CE 235 or equivalent. [3]

CE 325A. Individual Study of Civil Engineering Problems. Literature review and analysis of special problems under faculty supervision. FALL, SPRING, SUMMER. [1-4 each semester]

CE 325B. Individual Study of Civil Engineering Problems. Literature review and analysis of special problems under faculty supervision. FALL, SPRING, SUMMER. [1-4 each semester]

CE 325C. Individual Study of Civil Engineering Problems. Literature review and analysis of special problems under faculty supervision. FALL, SPRING, SUMMER. [1-4 each semester]

CE 351. Public Transportation Systems. Comprehensive study of public transportation, with emphasis on planning, management, and operations; paratransit, ridesharing, and rural public transportation systems. Prerequisite: CE 256. SPRING. [3]

CE 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: CE 225 or consent of instructor. [3]

CE 355. Advanced Transportation Design. An in-depth view of the design process. Complex design problems and solutions, with the use of computer-based analytical and design tools. Comprehensive design projects. Prerequisite: CE 255. SPRING. [3]

CE 356. Advanced Transportation Planning. A continuation of the concepts from CE 256, with emphasis on analytical techniques used in forecasting travel. Use of computer-based models, transportation and energy contingency planning methods. Prerequisite: CE 256. SPRING. [3]

CE 357. Theory of Traffic Flow. A study of 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: CE 257. [3]

CE 359. Emerging Information Systems Applications. 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 transportation or manufacturing operations or consent of instructor. FALL. [3]

CE 369. Master's Thesis Research.

CE 371A. Reliability and Risk Engineering Seminar. Seminars by expert speakers will provide a wide range of perspectives on reliability and risk assessment and management of multi-disciplinary 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]

CE 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]

CE 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

CE 389. Master of Engineering Project. Master of Engineering Project

CE 399. Ph.D. Dissertation Research.

ENVE 252. Physical Hydrology. Development of fundamental bases of hydrological processes. Land-atmosphere processes, surface-water flows, soil moisture dynamics, and groundwater flows. Exposition of physical principles, their embodiment in mathematical models, and their use in interpreting observations in the field and laboratory. Prerequisites: CE 203 or ME 224 or ChBE 230 or EES 255. FALL. [3]

ENVE 254. Energy and Water Resources. Scientific, technological, philosophical, and social issues surrounding approaches to carbon-based energy and alternative energy resources, management of carbon through sequestration, supplying and treating water for agriculture, communities, and industry, and changing climate impacts on regional distribution of water resources. SPRING. [3]

ENVE 260. Solid and Hazardous Waste Management. An introduction to solid municipal and hazardous waste management including generation, characterization, collection, treatment and disposal. Emphasis given to the legal requirements, risk assessment and management, costs and policy considerations including pollution prevention, recycling and substitution. SPRING. [3]

ENVE 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 227. FALL. [3]

ENVE 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. Prerequisite: senior standing or consent of instructor. FALL. [3]

ENVE 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]

ENVE 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. Prerequisite: Chem 102a and 102b, Math 198, CE 226 or equivalent, and senior standing or consent of instructor. FALL. [3]

ENVE 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. Prerequisite: Chem 102a and b and senior standing or consent of instructor. FALL. [3]

ENVE 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 biode-

gradability. 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. Prerequisite: senior standing or above. SPRING. [3]

ENVE 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. Prerequisite: junior standing, CE 226, ENVE 271, or consent of instructor. SPRING. [3]

ENVE 274. Surface Water Quality Modeling. Analysis of physical, chemical, biological, and physiological contaminants in streams, lakes, and estuaries, and surface water/groundwater interfaces. Analytical and numerical modeling techniques. One- and two-dimension computer simulation of surface water quality. Prerequisite: ENVE 270 or equivalent. SPRING. [3]

ENVE 276. Groundwater Hydrology. The occurrence and flow of ground water. 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. Prerequisite: Math 198; CE 203. SPRING. [3]

ENVE 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. Prerequisite: CE 226 or equivalent and senior standing or above. SPRING. [3]

ENVE 280. Atmospheric Pollution. (Also listed as ChBE 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. Prerequisite: junior standing. SPRING. [3]

ENVE 296. Operational Risk Management. Development of safety and security programs for protecting human health, the environment and business continuity. Focus on defining an all-hazards 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]

ENVE 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. Prerequisite: CE 203, Math 198. FALL. [3]

ENVE 325A. Individual Study. Literature review and analysis, or laboratory investigation of special problems under faculty supervision. FALL, SPRING, SUMMER. [Variable credit: 1-4 each semester]

ENVE 325B. Individual Study. Literature review and analysis, or laboratory investigation of special problems under faculty supervision. FALL, SPRING, SUMMER. [Variable credit: 1-4 each semester]

ENVE 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]

ENVE 369. Master's Thesis Research.

ENVE 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

ENVE 389. Master of Engineering Project. Master of Engineering Project

ENVE 399. Ph.D. Dissertation Research.

Epidemiology

EPID 301. Introduction To Statistical Computing And Programming Workshop. This course is designed for students who seek to develop skills in statistical computing. Students will learn how to use R and STATA for data management, database querying, reporting generating, data presentation, and data tabulation and summarization. Topics include: organization and documentation of data, input and export of data sets; methods of cleaning data; tabulation and graphing of data; programming capabilities; and an introduction to simulations and bootstrapping. Students will also be introduced to LATEX and SWEAVE for report writing. Students will also be briefly introduced to SAS. [2]

EPID 310. Causal Inference And Logic. This course will concentrate on conceptually grasping tools of logic and critical thinking as they apply to epidemiologic research. Our emphasis will be on rigorous definition of a causal effect and the minimal conditions necessary to consistently estimate such effects. In a small group format, we will examine case studies and anchor our discussions in readings from philosophy of science, logic, and probability. We will cover examples of valid and fallacious arguments, probability calculus, probabilistic fallacies, applications of Bayes theorem, the frequentist and Bayesian perspective, counterfactual logic, introduction of directed acyclic graphs (DAG), and interpretation of p-values and confidence intervals in epidemiologic research. [3]

EPID 311. Epidemiologic Theory And Methods I. This is the first of a two-course series on advanced epidemiologic concepts and methods that includes measures of disease frequency, measures of effect, descriptive epidemiology, study designs, bias, misclassification and effect measure modification, and ethics in epidemiologic research. A case-based approach will engage students in demonstrating concepts using actual research data and in critical appraisal of case studies and publications that feature strong and weak examples. [4]

EPID 312. Epidemiologic Theory And Methods II. This second in a two-course series provides an in-depth treatment of concepts and skills in epidemiologic research, including problem conceptualization, study design, data analysis and interpretation. Includes emphasis on how to design studies to best measure etiologic effects and includes advanced discussion of confounding, interaction, and missing data. A continued case-based approach will engage students in demonstrating concepts and methods using the students' own data. Prerequisite: 311: Epidemiologic Theory and Methods I. [4]

EPID 315. Scientific Writing I. Scientific Writing I. Participatory course in which students develop skills in presenting research results in manuscripts, abstracts, and posters. Students work in small groups to write and critique published and unpublished manuscripts, with a focus on understanding the essential components of a scientific manuscript or presentation, as well as the process of publishing in the peer-reviewed literature and managing reviewer and editor comments and requests. [1]

EPID 316. Research Planning Workshop. Research Planning Workshop. This course is designed to guide students through the initial stage of formulating an epidemiologic research topic and plan, prior to the development of a full research proposal. [1]

EPID 317. Public Health Ethics. Public Health Ethics. Basic ethical rationales underlying concerns central to public health. These include: ethical reasoning; concepts of justice; the influences of religion; principles of interacting with communities; professional conduct; and research ethics. SUMMER [1]

EPID 321. Epidemiologic Methods: Design and Analysis with Binary Data. Epidemiologic Methods: Design and Analysis with Binary Data. Concepts and applications, including logistic regression, binomial regression, ordinal regression, multinomial regression, quantile regression, model building strategy, additive and multiplicative interaction, clustered and longitudi-

nal data, and graphical exploration. Includes computer-based experience with real data. Fall [3]

EPID 322. Readings in Epidemiologic Modeling. Readings in Epidemiologic Modeling: Binary Data. Additional reading sin the philosophy and technique of epidemiologic modeling with binary data will be explored in greater depth, including current articles that highlight challenges and novel approaches. FALL [1]

EPID 323. Epidemiolgic Methods: Design and Analysis with Time-to-Event Data. Epidemiolgic Methods: Design and Analysis with Time-to-Event Data. Concepts and applications in survival analysis and analysis of incidence rates, including truncation and censoring, life tables, non-parametric approaches (e.g. Kaplan-Meier, log-rank), semi-parametric approaches (e.g. Cox models, proportional hazards regression), parametric approaches (e.g. Weibull, gamma regression) accommodating time-dependent exposures, Poisson regression, sensitivity analysis, bootstrapping, and multiple imputation. SPRING [3]

EPID 324. Readings in Epidemiological Modeling: Time-to-Event Data. Readings in Epidemiological Modeling: Time-to-Event Data. Additional readings in the philosophy and technique of epidemiologic modeling with time-to-event data will be explored in greater depth, including current articles that hightlight challenges and novel approaches. SPRING. [1]

EPID 325. Scientific Writing II - Proposal Development in Epidemiology. Scientific Writing II - Proposal Development in Epidemiology. Paricipatory course in which each student develops a high quality, detailed research proposal suitable for submission to NIH or AHRQ that includes both a technical proposal and a draft budget justification. Includes lecture, in-class exercises and group processes. SPRING [1]

EPID 326. Field and Clinical Methods in Epidemiology. Field and Clinical Methods in Epidemiology. Practical research skills for clinical investigators, including instrument development, project management, data management, data analysis, and the communication of research results. SPRING. [1]

EPID 331. Seminar In Quantitative Methods And Measurement. Concepts and application of cross-cutting tools used for unique and/or specialized types of measurement and instrument development for areas such as physical activity, clinical laboratory tests, and imaging studies. May be repeated. [2]

EPID 332. Advanced Methods For Epidemiology. These methods electives will be taught in modular format, most often with three modules on related methods topics, which will vary annually. Students will explore methodological issues in epidemiology like measurement error, missing data, intermediate variables, complex study designs, meta-analysis, splines, propensity scores, simulation. Exercises with provided datasets and the student's own data will be included. May be repeated. [1-3]

EPID 340. Content Area Intensives. These intensives are offered on a rotating basis and taught by faculty with research expertise in the content area of focus. Areas of epidemiology may include cancer, cardiovascular disease, child health, chronic disease/diabetes, genetics, global health, health care, infectious disease, nutrition, pharmacoepidemiology, reproductive, and social. May be repeated. [1-3]

EPID 356. Clinical Trials. Clinical Trials. Systemic overview of principles in design, implementation, and analysis of clinical trials. Emphasis on applications in chronci disease epidemiology. In-depth details of case examples from cardiovascular disease and cancer treatment and prevention trials will be covered. FALL. [3]

EPID 357. Decision Analysis and Cost Effectiveness. Decision Analysis and Cost Effectiveness. Overview and practice of conducting decision analysis, including cost effectiveness in epidemiologic research and to the translation and utility of epidemiologic data. FALL [3]

EPID 358. Molecular Techniques for Public Health Records. Molecular Techniques for Public Health Records. This course presents an introduction to the principles of the molecular techniques used in epidemiologic investigations. Emphasis will be on the development of a general understanding of the techniques and vocabulary necessary to communicate with researcher and laboratory personnel involved in the study of disease both at the individual and population level. FALL. [3]

EPID 359. Event Surveillance & Math Modeling of Dispersion. Event Surveillance & Math Modeling of Dispersion. Overview and practice of event surveillance and mathematical modeling for a variety of research areas, including infectious disease and environmental epidemiology. SPRING [3]

EPID 360. Advanced Predictive Modeling and Simulation. Advanced Predictive Modeling and Simulation. Exploration of hte underlying philosophy and approach to predictive modeling. Includes practical experience in developing predictive models and simulations, including measures of fit, statistical approaches to building and comparing models, and approaches to best reporting the results and implications of such methods. SPRING. [3]

EPID 370. Current Topics In Research. Students attend weekly presentations selecting from the Vanderbilt Epidemiology Center Seminar Series, Biostatistics Clinic, clinical grand rounds on topics related to content area interests, and other relevant seminars. Students will convene with faculty to reflect on and critique components of research presentations relevant to the students' interests and to the contemporaneous topics being covered in the core epidemiology curriculum. Course assignments will focus on critical appraisal of a methodologic challenge identified in a seminar setting that has immediate relevance to the student's own research. May be repeated. [1]

EPID 371. Special Topics Seminar In Epidemiology. Faculty offer small groups of students a study course on a topic of mutual interest and concern in the faculty member's area of expertise. May be repeated. [1-3]

EPID 372. Advanced Readings In Epidemiology. Additional readings in specialized epidemiologic topics will be explored in depth under the guidance of a faculty member. May be repeated. [1-3]

EPID 373. Independent Study In Epidemiology. Designed to allow the student an opportunity to master advanced skills in epidemiology while pursuing special projects under individual members of the faculty in their areas of expertise. May be repeated. [1-3]

EPID 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

EPID 399. Ph.D. Dissertation Research.

Financial Economics

FNEC 261. Investment Analysis. Investment principles and practices. Security analysis for developing techniques and standards of an investment appraisal. Principles of portfolio analysis. The forecasting problem in meeting portfolio needs of individuals and institutions. Develop ability to investigate and report. Prerequisite: 240. [3]

FNEC 275. Financial Management. Analysis of cases representing capital budgeting, forecasting cash flow, risk assessment, capital structure, mergers and acquisitions. Seminar. Prerequisite: 240. [3]

French

FREN 101g. French for Graduate Reading. Survey of grammar and vocabulary, with extensive reading. Available to graduate students for "no credit" only. [0]

FREN 222. Introduction to Francophone Literature. The geopolitical, linguistic, and literary dimensions of the notion "La Francophonie." Readings will be chosen from fictional and nonfictional works from Africa, Canada, the Caribbean, Indian Ocean, and Vietnam. Prerequisite: 201W and 211. [3]

FREN 234. Medieval French Literature. Thematic exploration of chronicles, romance, poetry, and theatre of medieval France and the history and culture that surrounded these literary productions. Prerequisite: 201W. [3]

FREN 237. The Early Modern Novel. Development of the novel as a genre in the seventeenth and eighteenth centuries; its changing social, intellectual, and political context. Prerequisite: 201W. [3]

FREN 238. The Twentieth-Century Novel. The novel as a genre in the context of modernity and post modernity. Readings will focus on narrative techniques. Prerequisite: 201W. [3]

FREN 239. The African Novel. The postcolonial francophone novel of Subsaharan Africa illustrating topics such as tradition and modernity, the identity of Africa, the representation of women, and the ideology of language. Prerequisite: 201W and 211. Recommended: 222. [3]

FREN 241. Emile Zola: From Naturalist Novels to Social Activism. The author's method of researching subject matter and style of writing. "Environmental" influences of violence, prostitution, and alcoholism. The idea of the "public intellectual." Prerequisite: 201W. [3]

FREN 255. French Feminist Thought: Literary and Critical. Feminist themes in twentieth-century French literature and criticism. Authors include Beauvoir, Duras, Sarraute, Irigaray, Cixous. Prerequisite: 201W and 211. Recommended: 212, 214. [3]

FREN 256. French Intellectual History. From Montaigne to Sartre and beyond. Critical discourses and major philosophical texts. Prerequisite: 201W. [3]

FREN 258. The Struggle of Encounter: The Israeli-Palestinian Conflict in Literature. The literary encounter between the Jewish and Arab worlds through representations of the Israeli-Palestinian conflict. Prerequisite: 201W. [3]

FREN 260. Enlightenment and Revolution. Major writers of the eighteenth century, including Montesquieu, Voltaire, Rousseau, Diderot; literature of the Revolution. [3]

FREN 261. Age of Louis XIV. Literature and society in the reign of Louis XIV. Authors include Mme de Lafayette, La Fontaine, Molière, Pascal, Racine, and Mme de Sévigné. Prerequisite: 201W. [3]

FREN 265. From Romanticism to Symbolism. Nineteenth-century literature through its major movements: Romanticism, Realism, Naturalism, and Symbolism. Prerequisite: 201W. [3]

FREN 267. Twentieth-Century French Literature. Critical readings of representative works organized thematically with emphasis on their contextual and intertextual relationships. Prerequisite: 201W. [3]

FREN 289. Independent Study. Content varies according to the needs of the individual student. Primarily designed to cover pertinent material not otherwise available in the regular curriculum. [Variable credit: 1–3 each semester, not to exceed 12 over a four-semester period]

FREN 294a. Special Topics in Traditions. Prerequisite: 201W. [3]

FREN 295a. Special Topics in Communications and Intersections. Prerequisite: 201W. [3]

FREN 300. Introduction to Research. Materials and methods of scholarly research, with attention to their relation to theories of literature. [3]

FREN 302. History of the French Language: Medieval Period. Syntax, morphology, phonology, emphasis on textual explication. Prerequisite: elementary knowledge of Latin. [3]

FREN 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. [3]

FREN 312. Second Language Acquisition Theories and Research. A review of current sociocultural and cognitive theories and research in SLA. [3]

FREN 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]

FREN 332. Seminar in Medieval French Literature. [3]

FREN 338. Seminar in Sixteenth-Century French Literature. [3]

FREN 342. Seminar in Seventeenth-Century French Literature. [3]

FREN 353. Seminar in Eighteenth-Century French Literature. [3]

FREN 362. Seminar in Nineteenth-Century French Literature. [3]

FREN 372. Seminar in Twentieth-Century French Literature. [3]

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

FREN 380. French Literary Theory. Literary theory as it has been shaped by and shapes the French tradition. [3]

FREN 388. Seminar in Francophone Literature. Literature of the French-speaking world ("La Francophonie"). [3]

FREN 394. Special Topics in French Studies. Problems, themes, or issues in literature, language, or culture approached in ways that transcend traditional chronological distinctions. [3]

FREN 399. Ph.D. Dissertation Research.

FREN 3995. Half-time Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

German

GER 101g. German for Graduate Reading. Survey of grammar and vocabulary, with extensive reading. Available only to graduate students for "No Credit". [0]

GER 213. German Conversation and Composition. Graduate credit for M.A.T. candidates only. Prerequisite: 103. [3]

GER 214. German Conversation and Composition. Continuation of 213. Graduate credit for M.A.T. candidates only. Prerequisite: 103. [3]

GER 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. [3]

GER 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. [3]

GER 221. 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. [3]

GER 222. German Culture and Literature. Continuation of 221. 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. [3]

GER 235. German Romanticism. The contributions of Schlegel, Tieck, Novalis, Eichendorff, and others to literature, philosophy, and theory. Intellectual, social, and political currents. [3]

GER 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]

GER 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 Infinities.* Readings in English, with option of German readings for German studies majors. Focal points: empirical investigation, philosophical interrogation, and scientific explanation. Taught in English. Prerequisite: completion of the Mathematics and Natural Science requirement of AXLE. [3]

GER 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. Taught in English. [3]

GER 242. German Mystery Novels: From Romanticism to Kafka. Novels and novellas (1780-1920) dealing with the uncanny, unsettling, inexplicable, and the irrational. Exploring the dark side of the human psyche. Methods and theoretical concepts to explain the "fantastic." [3]

GER 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]

GER 244. German Fairy Tales: From Brothers Grimm to Walt Disney. The German fairy tale tradition and its role in American culture. Taught in English. [3]

GER 245. Love and Friendship. Concepts of life and friendship, Greek antiquity to Romanticism, modern and postmodern times. Philosophical and literary texts, letters, and essays. Taught in English. [3]

GER 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]

GER 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. [3]

GER 262. German Literature of the Middle Ages. Examines sites of literary production (monasteries, courts, urban centers) and the evolution of literary language. [3]

GER 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]

GER 264. Pleasures and Perils in Nineteenth-Century Theatre. The German drama and dramatic theory from Romanticism up to Naturalism with emphasis on selected works by Kleist, Büchner, Grillparer, and Hebbel. [3]

GER 265. Revolutionizing Twentieth-Century Theatre. German drama and dramatic theory from Naturalism to the present. Emphasis on Brecht and post-Brechtian drama. [3]

GER 266. Nineteenth-Century Prose. A study of representative works of the main literary trends from Romanticism to Naturalism. [3]

GER 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]

GER 269. Writing under Censorship. An introduction to the main literary trends and authors of the former East Germany (1949–1989). [3]

GER 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. [3]

GER 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]

GER 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 knowledge of German required. [3]

GER 274. Who Am I? German Autobiographies. Canonical and noncanonical texts from the nineteenth and twentieth centuries constructing cultural, religious, and gender identities. Taught in English. [3]

GER 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 theatre; new directions in art and media theory; historical influences. Taught in English. [3]

GER 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. Taught in English. [3]

GER 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. Taught in English. [3]

GER 289a. 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 289a and 289b combined]

GER 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 289a and 289b combined]

GER 294a. Selected Topics. May be repeated to a total of 12 hours in 294a and 294b combined. [3]

GER 294b. Selected Topics. May be repeated to a total of 12 hours in 294a and 294b combined. [3]

GER 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 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. [3]

GER 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]

GER 314. Bibliography and Methods. An introduction to German studies in the U.S., to the resources and practice of literary history and criticism. [3]

GER 316. Literary Theory and Criticism. Selected problems of literary theory, history, and interpretation. [3]

GER 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. [Variable credit: 1–2 each semester, not to exceed a total of 6]

GER 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]

GER 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]

GER 340. Beyond Good and Evil. [3]

GER 350. Graduate Tutorials. Graduate Tutorials. Supervised reading in special areas of German language and literature according to a fixed syllabus. Number, content, and schedule of meetings with the instructor are predetermined, as are reading assignments, tests, term papers, and grading procedure. Units are related to the content and method of period seminars and other graduate courses and allow students to deepen their knowledge of subjects not covered in depth in formal courses offered by the department. Students may not take more than one unit per semester. [3]

GER 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]

GER 369. Master's Thesis Research. [0]

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

GER 385a. Problems in Germanic Languages and Literatures. [3]

GER 385b. Problems in Germanic Languages and Literatures. [3]

GER 387. Seminar: Studies in Medieval Literature. [3]

GER 388. Seminar: Studies in Literature 1400–1680. [3]

GER 389. Seminar: Eighteenth-Century German Literature. [3]

GER 390. Seminar: Nineteenth-Century German Literature. [3]

GER 391. Seminar: Twentieth-Century German Literature. [3]

GER 392. Seminar: Problems of Theory in German Studies. Author, Archive, Work. [3]

GER 393. Seminar: Intellectual Constellations. [3]

GER 394. Seminar: Society and Ethics. [3]

GER 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]

GER 399. Ph.D. Dissertation Research.

GER 3995. Half-time Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

Greek

GRK 201. Beginning Greek I. Elements of classical Greek. Reading of simplified texts from authors of the fifth and fourth centuries B.C. [4]

GRK 202. Beginning Greek II. 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. [4]

GRK 203. Intermediate Greek I: Classical and Koiné Greek. Review of Greek grammar, and reading from classical and biblical texts. Prerequisite: 202. [3]

GRK 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. [3]

GRK 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. [3]

GRK 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. [3]

GRK 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]

GRK 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]

GRK 240. The Gospels in Greek. Matthew and selections from the other Gospels. Prerequisite: 203 or departmental placement. [3]

GRK 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. [Variable credit: 1–3 each semester, not to exceed a total of 6]

GRK 294. Special Topics in Greek Literature. May be repeated for credit with change of subject matter. [3]

GRK 313. Seminar in Classical Greek Prose. May be repeated for credit with change of subject matter. [3]

GRK 314. Seminar in Classical Greek Poetry. May be repeated for credit with change of subject matter. [3]

GRK 320. Seminar in Early Greek Poetry. [3]

Hearing and Speech Sciences

HRSP 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.(Also listed as SLP 5206)

HRSP 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. FALL. [3] Hornsby.

HRSP 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. (Also listed as SLP 5300)

HRSP 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. (Also listed as SLP 5301)

HRSP 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.

HRSP 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. (Also listed as AUD 5303)

HRSP 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. [3] Schuele. (Also listed as SLP 5304)

HRSP 305. Clinical Principles and Procedures. Presentation and demonstration of clinical principles and procedures applicable in communication sciences and disorders. FALL. [2] Golper. (Also listed as SLP 5305)

HRSP 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. (Also listed as SLP 5306)

HRSP 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.

HRSP 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. SUMMER. [3] Hayes. (Also listed as MDE 5308)

HRSP 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. SUMMER. [1] Hayes. (Also listed as MDE 5309)

HRSP 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, Bradham. (Also listed as AUD 5310)

HRSP 311. Stuttering. Significant research in the field of stuttering, with emphasis on etiology and therapy. The management of fluency disturbances. SPRING. [3] Conture. (Also listed as SLP 5311)

HRSP 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] Hayes. (Also listed as MDE 5312)

HRSP 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. (Also listed as SLP 5314)

HRSP 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. SPRING. [3] Wallace.

HRSP 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. SPRING. [2] Schneider. (Also listed as SLP 5316)

HRSP 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] de Riesthal. (Also listed as SLP 5317)

HRSP 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. (Also listed as AUD 5318)

HRSP 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. (Also lsited as SLP 5319)

HRSP 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] (Also listed as MDE 5320)

HRSP 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. SUMMER. [2]

HRSP 323. Communication 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. [2-3] Wallace. (Also listed as SLP 5323)

HRSP 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. (Also listed as SLP 5324)

HRSP 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. (Also listed as AUD 5325)

HRSP 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. (Also listed as AUD 5327)

HRSP 328. Psychoacoustics. Psychoacoustic theory and methods. Auditory perception in normally hearing and hearing impaired subjects. SPRING. [3] Hornsby. (Also listed as AD 5328)

HRSP 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.

HRSP 331. Aphasia. The study of aphasia in adults, including the neuronanatomical basis, etiologies, symptomatology, assessment, differential diagnosis, and treatment. SPRING. [3] de Riesthal. (Also listed as SLP 5331)

HRSP 332. Pathology of the Auditory System. A study of pathologies involving the peripheral auditory system arising from genetic, disease, and trauma, with emphasis applied to presenting signals/systems, and medical/audiological management. FALL. [3] Hood. (Also listed as AUD 5332)

HRSP 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]

HRSP 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. [1-2] Gutmann. (Also listed as SLP 5335)

HRSP 336. Voice Disorders. Theories of voice production, with emphasis upon underlying mechanisms that cause vocal defects. Procedures for group and individual management. SUMMER. [3] Jacobson. (Also listed as SLP 5336)

HRSP 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. (Also listed as SLP 5338)

HRSP 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. (Also listed as AUD 5340)

HRSP 341. Seminar in Audiology. Significant literature in the field of audiology. Directed study in assigned subject areas. FALL, SPRING, SUMMER. [2]

HRSP 342. Seminar in the Neurobiology of Hearing and Multisensory Processes. (Also listed as Neuroscience 342) 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.

HRSP 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. [2] Staff. (Also listed as AUD 5343)

HRSP 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.

HRSP 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. (Also listed as AUD 5345)

HRSP 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 vestibulocular reflex; case history and bedside assessment of the dizzy patient, technique and interpretation of electronystagmography, rotational testing, computerized dynamic posturography and sonomotor 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. FALL. [3] Jacobson, McCaslin. (Also listed as AUD 5346)

HRSP 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. SUMMER. [3] Jacobson, McCaslin. (Also listed as AUD 5347)

HRSP 348. Audiology in Education. 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. FALL. [3] Fino-Szumski. (Also listed as SPED 2600 and AUD 5348)

HRSP 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, vibrotactile devices, and cochlear implants will be demonstrated. Co- or prerequisite: SPED 2600 or HRSP 348. FALL. [1] Fino-Szumski. (Also listed as AUD 5348)

HRSP 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]

HRSP 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]

HRSP 353. Amplification III. 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. (Also listed as AUD 5353)

HRSP 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. [2-3] Ricketts. (Also Listed as AUD 5354)

HRSP 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, Webb. (Also listed as SLP 5357)

HRSP 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. (Also listed as SLP 5361)

HRSP 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. FALL. [3] Rosenfeld. (Also listed as AUD 5363)

HRSP 369. Master's Thesis Research.

HRSP 371A. 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. (Also listed as AUD 5371)

HRSP 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.

HRSP 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.

HRSP 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)

HRSP 376. Language Research Methods. This doctoral-level seminar provides an in-depth analysis of research methods to study language development in children of all ages. Methods used within various fields (e.g. linguistics, communication sciences and disorders, developmental psychology) are reviewed. Critical analysis of research articles with typical and atypical language learners. Spring [3] Schuele.

HRSP 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.

HRSP 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

HRSP 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]

HRSP 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]

HRSP 382A. 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)

HRSP 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)

HRSP 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]

HRSP 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, SUMMER. [3] Staff.

HRSP 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.

HRSP 386. Instrumentation for Hearing and Speech Sciences: Matlab 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 MATLAB programming to real-time laboratory problems. Prerequisite: 385. SPRING of even-numbered years. [3] Grantham.

HRSP 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.

HRSP 388. Independent Study and Readings in Speech Pathology. FALL, SPRING, SUMMER. [3]

HRSP 389. Independent Study and Readings in Audiology. FALL, SPRING, SUMMER. [3]

HRSP 398. Preliminary Doctoral Research [0].

HRSP 399. Ph.D. Dissertation Research.

HRSP 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

HIST 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 students who completed 250 prior to fall 2008. [3]

HIST 209. Russia: Old Regime to Revolution. (Formerly 238). Russian history from the early nineteenth-century old regime through the Russian Revolution of 1917. Culture, society, and serfdom; the Great Reforms, ideology, and radicalism; industrialization; modernity in an agrarian society; twentieth-century revolutions. Serves as repeat credit for students who completed 238 prior to fall 2008. [3]

HIST 212a. India and the Indian Ocean. Cultures along the Indian Ocean coastline from Roman times to 1800, especially South Asia. Coastal societies and politics, Islam, pilgrimage and trade, economic zones, and cultural ties. Pirates, seafarers and merchants; diasporas and genealogies. The entry of European trading companies and debates on trade and empire. [3]

HIST 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 students who completed 257 prior to fall 2008. [3]

HIST 217. Islam and the Crusades. Ideology; successes and failures; history and character of Crusader enterprises in the Holy Land and elsewhere. Muslim religious, political, ideological, and social reactions. Islamic culture and the West; relations among Crusaders, Muslims, and Jews. [3]

HIST 219. Last Empire of Islam. The Ottoman "long nineteenth century," 1789 to 1923. The Reforms (Tanzimat), state patriotism, intercommunal relations, national "awakenings," and the emergence of a public sphere. Historiographical issues, such as perceptions of the empire as the "Sick Man of Europe" and debates over its decline. [3]

HIST 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 students who completed 233 prior to fall 2008. [3]

HIST 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 students who completed 213 prior to fall 2008. [3]

HIST 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 students who completed 214 prior to fall 2008. [3]

HIST 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 students who completed 215 prior to fall 2008. [3]

HIST 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 students who completed 218 prior to fall 2008. [3]

HIST 227. Nineteenth-Century Europe. (Formerly 220). Major political, social, economic, and cultural developments from 1815 to 1914. Serves as repeat credit for students who completed 220 prior to fall 2008. [3]

HIST 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 students who completed 225 prior to fall 2008. [3]

HIST 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 students who completed 226 prior to fall 2008. [3]

HIST 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 students who completed 231 prior to fall 2008. [3]

HIST 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 students who completed 234 prior to fall 2008. [3]

HIST 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 students who completed 235 prior to fall 2008. [3]

HIST 239a. The Real Tudors. Marital, dynastic history of the Tudors in relation to religious and political change through and after the English Reformation. Court politics, ideological conflict, and the rise of an increasingly confessionalized international politics. [3]

HIST 241. Victorian England. (Formerly 245). Cultural values, liberal reform; urbanization; women and gender; imperialism. Serves as repeat credit for students who completed 245 prior to fall 2008. [3]

HIST 243W. 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 students who completed 268 prior to fall 2008. [3]

HIST 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 students who completed 258 prior to fall 2008. [3]

HIST 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 students who completed 259 prior to fall 2008. [3]

HIST 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 students who completed 261 prior to fall 2008. [3]

HIST 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 students who completed 262 prior to fall 2008. [3]

HIST 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 students who completed 265 prior to fall 2008. [3]

HIST 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 students who completed 264 prior to fall 2008. [3]

HIST 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 students who completed 263 prior to fall 2008. [3]

HIST 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 students who completed 266 prior to fall 2008. [3]

HIST 253a. Latin America and the United States. The complicated relationship between Latin America and the United States from the early nineteenth century to the present. Role of ideology, national security, economic interests, and cultural factors in shaping inter-American affairs. [3]

HIST 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 students who completed 267 prior to fall 2008. [3]

HIST 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 completed 173 prior to fall 2008. [3]

HIST 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 students who completed 276 prior to fall 2008. [3]

HIST 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 students who completed 277 prior to fall 2008. [3]

HIST 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 students who completed 278 prior to fall 2008. [3]

HIST 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 students who completed 273 prior to fall 2008. [3]

HIST 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. [3] Schwartz. Serves as repeat credit for students who completed 282 prior to fall 2008. [3]

HIST 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 students who completed 283 prior to fall 2008. [3]

HIST 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 students who completed 204 prior to fall 2008. [3]

HIST 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 students who completed 205 prior to fall 2008. [3]

HIST 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 "alternative medicine" in the U.S. Serves as repeat credit for students who completed 248 prior to fall 2008. [3]

HIST 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 students who completed 206 prior to fall 2008. [3]

HIST 284b. Health and the African American Experience. Disparities in the health care of African Americans, the training of black professionals, and the role of black medical institutions. The intersection between black civic involvement and health care delivery; the disproportionate impact of disease and epidemics within the African American population. [3]

HIST 285a. Human Biological Enhancement. Debates over human trait modification through recent advances in pharmaceuticals, bioelectrics, and genetics. Long-term social, cultural, and moral consequences. [3]

HIST 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. [3]

HIST 287g. Making of Modern Paris. The social and cultural history of Paris from the old regime to the present. Paris versus the French provinces; revolutionary upheavals; challenges of rapid urbanization. Paris as a literary, artistic, and consumer capital; its changing physical landscape. Immigration and the globalization of Paris. [3]

HIST 288a. Religion, Culture, and Commerce: The World Economy in Historical Perspective. Cross-cultural trade in a broad chronological and geographical framework. Pre-modern and modern times, western and non-western locales. The role of religion in economic exchange and the movement of commodities. [3]

HIST 288d. Images of India. Images in and of South Asia, studied through maps, religious imagery, print culture, cinema, and architecture. The politics of visual stereotypes of India. The visual history of Orientalism, modernity, gender, and religion in South Asia. [3]

HIST 300a. Introduction to Historical Methods and Research. [4]

HIST 300b. Introduction to Historical Methods and Research. [4]

HIST 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. [4]

HIST 302a. Readings in American History. To the Civil War. [4]

HIST 302b. Readings in American History. Civil War to the present. [4]

HIST 305. Studies in Comparative History. [4]

HIST 309. Studies in the Philosophy of History. [4]

HIST 315. Studies in Early Modern European History. [4]

HIST 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]

HIST 320. Studies in European History, 1815–1914. [4]

HIST 321. Topics in European History. [4]

HIST 324. Studies in Recent European History. [4]

HIST 330. Studies in German History. [4]

HIST 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]

HIST 343. Studies in Early Modern English History. [4]

HIST 344a. Studies in Modern England. [4]

HIST 344b. Seminar in Modern England. [4]

HIST 347. Topics in the History of Medicine, Science, and Technology. [4]

HIST 350. Topics in the History of the Human Sciences. [4]

HIST 350a. History of Biography. Art of biography; autobiography and biography; examination and analysis of major works in the nineteenth and twentieth century biography. [4]

HIST 350b. History of Biography. Entire semester devoted to the projection of a major biographical essay. [4]

HIST 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. [4]

HIST 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]

HIST 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]

HIST 361. Topics in Latin American History. [4]

HIST 362. History of Gender and Women in Colonial Latin America. Interdisciplinary and crosscultural 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]

HIST 365. Seminar in Latin American History. [4]

HIST 369. Master's Thesis Research. [0]

HIST 371. Studies in Early American History to 1783. [4]

HIST 372. Studies in the Middle Period of American History, 1783–1861. [4]

HIST 373. Studies in U.S. History, 1861–1900. [4]

HIST 374. Studies in Recent American History. [4]

HIST 375. Seminar in Recent American History. [4]

HIST 378. Studies in the History of the South. [4]

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

HIST 380. Studies in American Diplomatic History. [4]

HIST 381. Topics in American History. [4]

HIST 382. Seminar in American Diplomatic History. [4]

HIST 385a. Studies in the Intellectual History of the United States. [3]

HIST 385b. Studies in the Intellectual History of the United States. [3]

HIST 386. Studies of Women in the United States. [4]

HIST 390a. Independent Study. [Variable credit: 1–3 each semester]

HIST 390b. Independent Study. [Variable credit: 1–3 each semester]

HIST 398. Dissertation Seminar. [0-4]

HIST 399. Ph.D. Dissertation Research. [3]

HIST 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

HART 207. Religious Art of the Roman Empire, 100-500 CE. Visual art reflecting religious beliefs and practices. Greco-Roman cults, early Christianity, and Rabbinical Judaism. [3]

HART 208. Art and Empire from Constantine to Justinian. An interdisciplinary study of Roman social, political, religious, and art historical developments in the fourth through sixth centuries CE. [3]

HART 220W. Michelangelo Buonarroti: Life and Works. Sculpture, painting, architecture, and graphic works of Michelangelo. His poetry and letters. The cultural, historical, religious, and political climate of his day; artistic ambience in Florence at the time of his training; his representation in contemporary, biographical, and critical literature; his profound influence upon artists of his own and subsequent generations. [3]

HART 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]

HART 242. Art since 1945. A survey of art produced in the United States and Europe since 1945 with an emphasis upon theory and the social and intellectual factors. [3]

HART 247. Himalayan Art: Art of the Divine Abode. Art of Nepal and Tibet from its inception to the present. Religious and cultural contexts. Initial western responses; Hindu and Buddhist art and architecture in Nepal; Tibetan Buddhist Art; artistic productions in the Tibetan diaspora; and souvenir art in Nepal. [3]

HART 248. The South Asian Temple. From its inception to the present. Morphological and stylistic analysis. Anthropological and ethnographical approach to temples as living communal entities. [3]

HART 256. 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. Serves as repeat credit for students who have completed CLAS 203. [3]

HART 262W. Gender and Sexuality in Greek Art. Iconography of vase-painting and sculpture, from the Archaic through the Hellenistic periods. Visual constructions of bodies, poses, gestures, and dress, reflecting cultural attitudes towards courtship, marriage, rape, prostitution, and homosexuality. Emphasis on methodological approaches and comparisons with modern societies. [3]

HART 264. Greek Sculpture. Style, materials, and techniques ca. 900–31 B.C. Sculptors' craft and their reasons for the creation of both free-standing and architectural sculpture. Serves as repeat credit for students who have completed CLAS 216. [3]

HART 265. Greek Vases and Society. Ancient Greek vases as social documents. Interdisciplinary approaches, including historiographic, stylistic, semiotic, contextual, and scientific. Production, trade, and the functions of vases in funerary and ritual contexts, particularly the symposium. The development of black-and red-figure vase painting and iconography. [3]

HART 266. Cities of the Roman East. Provincial centers, sanctuaries, and monuments from Greece to Arabia. Major centers and case studies of public and private commissions. Architectural reflections of Romanization and resistance; local and imperial patronage; patrimony and memory; borderland architecture. [3]

HART 268. 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. Serves as repeat credit for students who have completed CLAS 217. [3]

Human Genetics

HGEN 320. Human Genetics. Research/techniques in human genetics. By arrangement. [Variable credit]

HGEN 330. Special Topics in Human Genetics. This course will provide students with an introduction to special topics in human genetics research, with emphasis on unanswered questions in the field. An introductory module will give students a basic understanding of human genetic principles. This will be followed by discussion of current special topics. Potential topics include: What do we know about the human genome and what do we have to learn? Is there a gene for everything? Is personalized medicine feasible? SPRING. [3] Spencer and Staff.

HGEN 340. Human Genetics I. (Also listed as Molecular Physiology and Biophysics 340) Designed to cover background and latest advances in human molecular genetics. Topics will include an overview and in-depth look at molecular genetics including DNA, RNA, and chromosome basics. Gene structure and transcriptional processing. Mutational mechanisms, biochemical genetics (gene defects in biochemical pathways). Topics will be discussed with use of real-world examples and relevance to human research. FALL. [3] Summar, Mortlock, and Staff.

HGEN 341. Human Genetics II. (Also listed as Molecular Physiology and Biophysics 341) 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, disease gene discovery (emphasizing design, statistical and molecular techniques), 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.

HGEN 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.

HGEN 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.

HGEN 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.

HGEN 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.

HGEN 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

HGEN 381. Molecular Foundations of Medicine. Molecular Foundations of Medicine is designed to familiarize students with the cellular structures, biomolecules, and processes that constitute life, human health, and disease at the molecular level. The course employs an integrated approach to teach underlying principles of biochemistry, cell and tissue biology, and genetics with an emphasis on human systems and medical conditions. The inclusion of clinical correlation sessions, small groups, and laboratory sessions will further integrate and broaden course material and relate molecular processes to the study of human disease. Prerequisite: MSTP students only. FALL. [Variable credit: 1-6] Osheroff, George, Pettepher.

HGEN 382. Structure, Function, and Development. Structure, Function, and Development is designed to provide students with the means to develop an effective understanding of the normal micro and macroscopic structure, function, and development of the human body. The course employs a coordinated, integrated approach to the presentation and learning of the disciplines of human gross anatomy, cell and tissue biology (histology), human development (embryology), and physiology in a context of clinical application. Prerequisite: MSTP students only. SPRING. [Variable credit: 1-3] Dalley, Strom, Pettepher.

HGEN 384. The Brain and Behavior. Brain and Behavior provides a basic understanding of the human central nervous system and human behavior. The format includes lectures, lab exercises, small group discussions, and patient and case presentations. Brain and Behavior integrates three areas of medical science: (1) neuroanatomy, physiology, and biochemistry; (2) psychopathology and systems neuroscience; and (3) pathology, pharmacology, and radiology. Prerequisite: MSTP students only. SPRING. [1] Norden, Heckers.

HGEN 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.

HGEN 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.

HGEN 399. Ph.D. Dissertation Research.

Interdisciplinary Materials Science

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]

CHBE 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]

CHBE 290. Special Topics in Chemical Engineering. Prerequisite: consent of instructor. [3] (Offered on demand)

CHBE 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, interface in composites, relationships of surface to bulk properties of materials. FALL. [3]

CHEM 235. Macromolecular Chemistry: Polymers, Dendrimes, and Surface Modifications. Synthesis and characterization of macromolecular materials including linear, branched, dendrimetric, and star polymers. Mechanical and physiochemical properties of polymeric types. Kinetics of living polymerization. Applications to nanostructures, templates, and advanced devices. Prerequisite: 102a-102b. FALL. [3] Harth. (Offered 2010/2011)

CHEM 312. Electrochemistry: Theory and Analysis. SPRING. [3] Cliffel.

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

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: 232. [3] Staff.

CHEM 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.

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] Harth.

EECE 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]

EECE 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]

EECE 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]

EECE 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]

EECE 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]

EECE 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]

EECE 307. Solid-State Effects and Devices II. The structure of solids, phonons, band theory, scattering phenomena, and theory of insulators. [3]

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. 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]

MSE 250. Materials Science II. A study of engineering materials that includes microstructure and property characterization, materials selection, failure analysis, modern processing methods, and an introduction to nanostructured materials. Case studies and challenge based learning will be used to develop structure-processing concepts for the practice of materials science and engineering. Prerequiste MSE 150. FALL. Wittig.

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]

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]

MSE 369. Master's Thesis Research.

MSE 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. Special Topics. Based on faculty research projects and highly specialized areas of concentration. FALL, SPRING. [Variable credit: 1-3 each semester]

MSE 392. Special Topics. Based on faculty research projects and highly specialized areas of concentration. FALL, SPRING. [Variable credit: 1-3 each semester]

MSE 397. 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 which do not fit simply into a single course category. FALL, SPRING. [0] Staff.

MSE 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 which do not fit simply into a single course category. FALL, SPRING. [0] Staff.

MSE 399. Ph.D. Dissertation Research.

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] Greene.

PHYS 225. Introduction to Quantum Physics and Applications I. A survey of modern physics and applications based on elementary quantum mechanics: atomic and molecular structure, interaction of light with atoms and molecules, spectroscopy. One three-hour laboratory per week. FALL. [4] Haglund, Velkovska.

PHYS 225W. Introduction to Quantum Physics and Applications I. A survey of modern physics and applications based on elementary quantum mechanics: atomic and molecular structure, interaction of light with atoms and molecules, spectroscopy. One three-hour laboratory per week. FALL [4] Haglund, Velkovska.

PHYS 226. Introduction to Quantum Physics and Applications II. A survey of modern physics and applications based on elementary quantum mechanics: condensed-matter physics, biophysics, special theory of relativity, nuclear and particle physics. One three-hour laboratory per week. SPRING. [4] Maguire, Helms.

PHYS 226W. Introduction to Quantum Physics and Applications II. A survey of modern physics and applications based on elementary quantum mechanics: condensed-matter physics, biophysics, special theory of relativity, nuclear and particle physics. One three-hour laboratory per week. SPRING. [4] Maguire, Helms.

PHYS 251A. Introductory Quantum Mechanics. Wave-particle duality, indeterminacy, superposition, the Schrödinger equation, angular mo-

mentum, the hydrogen atom, and time-independent perturbation theory. FALL. [3] Csonna, Hertel.

PHYS 251B. Introductory Quantum Mechanics. Spin and indistinguishability, time-dependent perturbation theory, matrix theory, scattering, applications to atomic physics, condensed matter physics, and astrophysics. Prerequisite: 229a. SPRING. [3] Csonna, Hertel.

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: 223 and 227a. SPRING. [3] Tolk.

PHYS 330A. 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: 251, Math 262. [3] Ernst, Oberacker.

PHYS 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: 251, Math 262. [3] Ernst, Oberacker.

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] Hutson.

PHYS 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.

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: 330a-330b. [3] (Not currently offered)

Interdisciplinary Social and Political Thought

INTE 320A. 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)

INTE 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)

INTE 369. Master's Thesis Research.

INTE 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

INTE 399. Ph.D. Dissertation Research.

Italian

ITA 101g. Italian for Graduate Reading. Survey of grammar and vocabulary, with extensive reading. Available only to graduate students for "No Credit". [0]

ITA 250. *Famous Women* by Boccaccio. Boccaccio's *Famous Women,* the first collection of female biographies. Evolution of the literary representation of women from classical times to the Renaissance. Contemporary criticism and theory. Taught in English. [3]

Japanese

JAPN 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. [5]

JAPN 202. Beginning Modern Japanese II. Prerequisite 200b or 201. [5]

JAPN 211. Second-Year Modern Japanese I. Development of conversational skills and pragmatic competence. Syntax, writing, and reading. Prerequisite: 202. [5]

JAPN 212. Second-Year Modern Japanese II. Prerequisite: 211. [5]

JAPN 241. Third-Year Japanese I. Reading and writing in contemporary Japanese texts. Conversation, discussion, and development of pragmatic competence. Prerequisite: 212. [3]

JAPN 242. Third-Year Japanese II. Prerequisite: 241. [3]

JAPN 251. Fourth-Year Japanese I. Reading, writing, and discussion in authentic Japanese cultural, literary, and historical texts. Prerequisite: 242. [3]

JAPN 252. Fourth-Year Japanese II. Prerequisite 251. [3]

JAPN 289a. 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. [Variable credit: 1–3, maximum of 12 hours over a four-semester period in 289a and 289b combined]

JAPN 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. [Variable credit: 1–3, maximum of 12 hours over a four-semester period in 289a and 289b combined]

Latin

LAT 201. Catullus. Reading and interpretation of Catullus' poems; aesthetic, political, and rhetorical contexts; fundamentals of Latin meter. Prerequisite: 104 or departmental placement. [3]

LAT 202. Ovid. Reading and interpretation of selections from the *Metamorphoses* or other works of Ovid. Prerequisite: 104 or departmental placement. [3]

LAT 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. [3]

LAT 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]

LAT 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, or philosophical works. Prerequisite: 104 or departmental placement. [3]

LAT 212. Roman Comedy. Reading of selected comedies of Plautus and Terence: study of the form of Roman comedy and its relation to the Greek New Comedy. Prerequisite: 104 or departmental placement. [3]

LAT 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. [3]

LAT 216. Tacitus. Selections from the works of one of Rome's most important historians, read in the context of historiographical tradition and political and social background. Prerequisite: 104. [3]

LAT 217. Suetonius. Selections from the works of one of Rome's most important biographers, read in the context of the Latin biographical tradition as well as the political and social background. Prerequisite: 104. [3]

LAT 220. Vergil: *The Aeneid.* An intensive study of the entire poem, in the context of the epic tradition. Prerequisite: 104 or departmental placement. [3]

LAT 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]

LAT 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. [3]

LAT 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. [3]

LAT 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. [Variable credit: 1–3 each semester, not to exceed a total of 6]

LAT 294. Special Topics in Latin Literature. May be repeated for credit with change of subject matter. [3]

LAT 313. Seminar in Classical Latin Prose. May be repeated for credit with change of subject matter. [3]

LAT 314. Seminar in Classical Latin Poetry. May be repeated for credit with change of subject matter. [3]

Latin American Studies

LAS 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. [3]

LAS 221. Institutional Approaches to Development in Latin America. The role of economic and political institutions in the development of Latin America. Transitions from dictatorship to democracy, poverty, corruption, property rights, and collective action. [3]

LAS 231. Music of Protest and Social Change in Latin America. Politics of musical culture. Music both as a marker of sociopolitical change and as an agent of political transformation. [3]

LAS 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). [3]

LAS 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]

LAS 290. Interdisciplinary Research Methods. Principal research methods and sources necessary for the study of Latin America in the social sciences and humanities. [3]

LAS 294a. Special Topics in Latin American Studies. Selected special topics suitable for interdisciplinary examination from the perspective of the social sciences and humanities. [3]

LAS 330. Culture and Music in the Mexican Borderlands. Ethnographies and interpretations of social-cultural life in the U.S.-Mexico borderlands. [3]

LAS 331. Music, Spirituality, and Performance. How religious events invoke music and dance to bond temporal humanity with spiritual eternity. Ways in which music reconstructs understandings of physical and metaphysical being and creates sacred identities and communities. [3]

LAS 369. Master's Thesis Research. [0]

LAS 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. [3]

LAS 390a. 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. [3]

LAS 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. [3]

Law and Economics

LWEC 349A. 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 director of graduate studies and supervising professor. [Variable credit]

LWEC 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 director of graduate studies and supervising professor. [Variable credit]

LWEC 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

LWEC 390. Ph.D. Dissertation Proposal Development. Prerequisite: permission of director of graduate studies. [Variable credit]

LWEC 399. Ph.D. Dissertation Research.

LWEC 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. Pre- or corequisite ECON 304a. [3]

LWEC 402. Law and Economics Theory II. Economic analysis of the law with applications from civil and criminal procedure, law enforcement, property, torts, decision making by courts, settlement negotiation, contracts, and antitrust. Prerequisite: LWEC 401; pre- or corequisite: ECON 304b. [3]

LWEC 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. Pre- or corequisite: ECON 304a. [3]

LWEC 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. Prerequisite: LWEC 403. [3]

LWEC 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. Pre- or corequisite: ECON 307, ECON 309, LWEC 401. [3]

LWEC 406. Research in Law and Economics. Students will develop and complete an original research paper. The paper may pose an original research question or may be a replication of an existing empirical result. [2]

LWEC 420. Labor Markets and Human Resources I. Economic, econometric, and legal analysis of the labor market. Topics include analysis of the economic impact of employment laws with a particular focus on antidiscrimination laws, use of labor market studies to estimate the value of statistical life, and behavioral labor economics and economic models of fairness in the employment relationship. Prerequisite: ECON 304a, ECON 307, ECON 309. [3]

LWEC 430. Risk and Environmental Regulation I. 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. Prerequisite: ECON 304a, ECON 307, ECON 309. [3]

LWEC 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. [3]

Leadership and Policy Studies

LPO 3386. Leading Globally Diverse Organizations. The goal of this course is to enable students to improve an organization's ability to work effectively across potential barriers imposed by culture, race, gender, and other dimensions of diversity. Students will explore the political, financial, and organization-specific issues with a focus on developing strategies to enhance inclusivity. [3]

LPO 3460. Special Topics in Education. Explores special issues or topics related to education. May be repeated. [1-6]

LPO 3461. Special Topics in School Administration. Explores special issues or topics related to education. May be repeated. [1-6]

LPO 3462. Special Topics in Higher Education Administration. Explores special issues or topics related to education. May be repeated. [1-6]

LPO 3464. Special Topics in Education Policy. Explores special issues or topics related to education. May be repeated. [1-6]

LPO 3470. Individual Study. Semi-independent study on selected topics in education. May be repeated. Consent of instructor required. [1-3]

LPO 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]

LPO 3505. K-12 Education Finance. This class focuses on the funding of K-12 finance with an emphasis on underlying social, political, and economic values associated with planning, developing, and delivering educational programs. Students also examine how these values are pursued programmatically with an emphasis on how revenues are generated, distributed, and budgeted to achieve desired educational outcomes. [3]

LPO 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]

LPO 3520. Instructional Leadership. Examines issues of school improvement and instructional leadership from the perspective of effective schools literature. [3]

LPO 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 also 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]

LPO 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]

LPO 3550. K-12 Education 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]

LPO 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]

LPO 3621. Ph.D. Seminar in K-12 Education Leadership and Policy. This required course for Ph.D. students in the K-12 Leadership and Policy Program focuses on research and policy issues that are studied in depth by LPO faculty. The content of the course changes each year, based on the research interests and focus of the faculty member teaching it. Rotating topics have included Measurement and Assessment; Instructional Leadership: Urban School Reform: and Teacher Policy. [3]

LPO 3622. Ph.D. Seminar in Higher Education Leadership and Policy. This required course for Ph.D. students in the Higher Education Leadership and Policy Program focuses on researh and policy issues that are studied in depth by LPO higher education faculty. The content of the course changes each year, based on the research interests and focus og the faculty members teaching it. Rotating topics have included History of American Higher Education; Organization and Governance of Higher Education; The Academic Profession: Structure and Roles;The College Student: Structure, Processes, and Effects; and Comparative Issues in Higher Education Policy Reform. [3]

LPO 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]

LPO 3690. Master's Thesis Research. [0-6]

LPO 3700. Organization and Governance of Higher Education. Explores various organization patterns of post-secondary educational institutions and state systems of higher education. Roles and responsibilities of governing boards, the president and other administrative offices, and involvement of faculty and students in college governance. [3]

LPO 3705. College and University Management. The purpose of this course is to prepare students to understand how colleges and universities are organized, governed, and managed. Particular attention will be paid to the utility of the literature for the management of higher education institutions. Students will have the opportunity to expand their understanding of the complex environment in which administrators operate. [3]

LPO 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]

LPO 3720. The College Student. 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]

LPO 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]

LPO 3740. Comparative Issues in Higher Education. 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]

LPO 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]

LPO 3790. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

LPO 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]

LPO 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]

LPO 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]

LPO 3825. Planning and Implementing Service-Learning Programs. Students will examine the key processes and elements of effective service-learning classes and programs and apply them to program design and implementation in schools and universities. Focus will be on the principles of good practice in service-learning and the growing body of evidence-based practice literature. [3]

LPO 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]

LPO 3835. Post Secondary Access. This seninar will explore how demographic change, public policy, and law promote and/or impede accessability to U.S. Higher Education. Students will be exposed to a variety of literature that is both multidisciplinary and multilevel in regard to governance (institutional, local, state, and federal policies). Since the primary theme of the seminar is access to post secondary institutions, course materials will focus on groups historically and currently underrepresented in U.S. higher education. THese include students who are low-income, race and ethnic minorities, and/or immigrant students. Inaddition, the course will explore the effects of educational intervention programs designed to increase college access as well as the role of state and federal legislation on higher education access rates. Upon completion of the seminar, students will have learned relavant policy analysis skills that include synthesisof research, clear and concise presentation of relavant facts to stakeholders, and strategies for making responsible policy recommendations. [3]

LPO 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]

LPO 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]

LPO 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]

LPO 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 uses case studies. [3]

LPO 3854. Crises in Higher Education: Analysis and Action. This course will explore how colleges and universities prepare for and respond to crisis situations. Specific institutional crises will be examined from multiple theoretical perspectives drawn from political science, organizational theory, law and other disciplines. Students will engage in case studies, analyses of current events, and participation in a crisis simulation. [3]

LPO 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]

LPO 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]

LPO 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]

LPO 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]

LPO 3890. College and University Finance. Current issues in financing higher education, sources of revenue, and 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]

LPO 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]

LPO 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. [3]

LPO 3912. Research Design and Methods of Education Policy. The purpose of this course is to provide an introduction to the practice of research and a survey of various research designs used in the study of education policy. The course develops understandings of the principles, processes and techniques used in educational research. The course is based on the premise that final published research develops and evolves through an iterative process. This research process requires decisions and judgements and careful consideration of alternatives. The goal for this course is for students to learn the formal principles of research design and to begin to understand how to conduct research by identifying and evaluating advantages and disadvantages and trade-offs of various research designs and data collection strategies. [3]

LPO 3916. Regression Analysis. Regression analysis is a widely used technique that allows us to 1) to describe average patterns of association among multiple variables observed in a sample and 2) to make inferences about the patterns of association among these variables in a population. The goal of this course is to develop an understanding of the basic methods, including their limitations, and to develop skill in using regression analysis to analyze non-experimental data. As an important part of any analysis is communicating the results to an audience, we will also place considerable emphasis on learning to present (in writing, tables, and figures) the results. [3]

LPO 3921. Ph.D. Student Research Practicum. LPO 3921, 3922, and 3922 are a single practicum that is taken over three semesters (Fall, Spring, Maymester) by first-year PhD students in LPO. The three courses must be taken in sequence. This practicum is designed to introduce students to the practice of research, particularly the applied side of quantitative research. This class has a strong emphasis on using programming skills to aid in the replication of work and to simplify complex analyses. [1]

LPO 3922. Ph.D. Student Research Practicum. LPO 3921, 3922, and 3923 are a single practicum that is taken over three semesters (Fall, Spring, Maymester) by first-year PhD students in LPO. The three courses must be taken in sequence. This practicum is designed to introduce students to the practice of research, particularly the applied side of quantitative research. This class has a strong emphasis on using programming skills to aid in the replication of work and to simplify complex analyses. [2]

LPO 3923. Ph.D. Student Research Practicum. LPO 3921, 3922, and 3923 are a single practicum that is taken over three semesters (Fall, Spring, Maymester) by first-year PhD students in LPO. The three courses must be taken in sequence. This practicum is designed to introduce students to the practice of research, particularly the applied side of quantitative research. This class has a strong emphasis on using programming skills to aid in the replication of work and to simplify complex analyses. [3]

LPO 3930. Research in Education. Individual programs of research in various education fields. Consent of faculty supervisor required. May be repeated. [1-6]

LPO 3931. Research in School Administration. Individual programs of research in various education fields. Consent of faculty supervisor required. May be repeated. [1-6]

LPO 3932. Research in Higher Education Administration. Individual programs of research in various education fields. Consent of faculty supervisor required. May be repeated. [1-6]

LPO 3934. Research in Education Policy. Individual programs of research in various education fields. Consent of faculty supervisor required. May be repeated. [1-6]

LPO 3940. 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]

LPO 3941. Field Experiences in School Administration. 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]

LPO 3942. Field Experiences in Higher Education Administration. 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]

LPO 3944. Field Experiences in Education Policy. 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]

LPO 3990. Ph.D. Dissertation Research.

Learning, Teaching, and Diversity

EDUC 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. [6]

EDUC 3003. Internship in Teaching: Music. Observation and teaching experience on a full-time basis. Includes two placements at two different age levels. Prerequisite: Admission to student teaching. Corequisite: EDUC 3004. [6]

EDUC 3004. Internship Seminar: Music. Study and discussion of experiences emerging from student teaching, particularly planning school programs and assuming full responsibility in the classroom. Corequisite: EDUC 3003. [1]

EDUC 3005. Internship Seminar: Elementary. Seminar to accompany EDUC 3000. [1]

EDUC 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 observation 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 observations of practice. For doctoral students or by permission of instructor. [3]

EDUC 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. [3]

EDUC 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. For doctoral students or by permission of instructor. [3]

EDUC 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. For doctoral students or by permission of instructor. [3]

EDUC 3110. Psychological Foundations of Education. (Also listed as PSY 334P) Emphasis on theories of human learning as they relate to design of instruction, educational practice, and human development at all age levels. [3]

EDUC 3120. Learning and Instruction. Introduces theories of learning and explores their utility for the design of learning environments. Contrasts socio-cultural and cognitive approaches toward concepts and categories, problem solving, and model-based reasoning. For doctoral students or by permission of instructor. [3]

EDUC 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. [3]

EDUC 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 is viewed in the context of school expectations with an emphasis on the diversity among learners. [3]

EDUC 3210. Theories and Curriculum Models in Early Childhood Education. Examines historical and social foundations for curriculum models of current interest in early childhood education. Emphases on curriculum design and the research base of program effectiveness. [3]

EDUC 3220. Parents, the School, and the Community. Focuses on parent participation, parent education, and community involvement in school programs. Laboratory experiences in school settings will examine ecological influences and environmental transactions among the home, school, and community. [3]

EDUC 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 para-professionals in areas of literacy development and methods for communicating the use of assessment information to guide instructional decisions. [3] Risko.

EDUC 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]

EDUC 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.

EDUC 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 para-professionals. [3] Risko.

EDUC 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. [3]

EDUC 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. [3]

EDUC 3490. Sociocultural Theories of Literacy. A doctoral readings seminar on social and cultural theories in their relation to literacy and literacy learning. [3]

EDUC 3500. Foundations of Education. An 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. [3]

EDUC 3510. Advanced Teaching in Secondary Schools. Exploration of teacher decision-making regarding creating conditions for learning, developing standards-based lessons, designing appropriate assessments, and balancing the personal and professional life of a teacher. [3]

EDUC 3520. Principles of ELL Education. This course, specifically designed for non-ELL majors, examines theoretically and empirically supported practices to support the education of students from culturally and linguistically diverse backgrounds in grades PreK-12. Topics include: the role of second language acquisition in academic achievement, instructional strategies used in a variety of program settings, appropriate assessment of ELLs in the classroom, the importance of ELLs home language and culture, and ESL research and history relating to policies and programs affecting ELLs. Consideration of how to attain more equitable outcomes for ELLs through schooling is a major focus of this course. [3]

EDUC 3530. Foundations for ELL Education. 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, it 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. Corequisite: 1 hr EDUC 3570 [3]

EDUC 3540. Methods and Materials for ELL Education. This course focuses on bilingual (native language and ESL) curriculum development and instruction for students (PreK-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. Corequisite: 1 hour EDUC 3570 [3]

EDUC 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]

EDUC 3560. Assessment of ELL Students. This course focuses on the theoretical and practical aspects of language testing for second-language learners. 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. Corequisite: 1 hr EDUC 3570 [3]

EDUC 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. Identifi-

cation 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. May be repeated. [1-3]

EDUC 3590. Issues in ELL Education Research: Research, Policy, and Instruction. Critically evaluates the most recent developments in research, policy, and instruction dealing with the second language learning and academic achievement of English language learners (ELLs). Research includes program evaluation studies, literature reviews focused on the learning of ELLs in specific content areas (math, science, social studies, and literature), and influential works by leading theorists and researchers. Policy focuses on citizen-sponsored ballot initiatives that directly impact ELLs, influential judicial decisions, and legislation designed to address the unique needs of these students. Instructional issues will be addressed partially by the reviews of the research and will be supplemented with a discussion of dominant instructional approaches and frameworks). [3]

EDUC 3610. Curriculum Foundations. Critical analysis of historical and contemporary curriculum research, theory, and practice in public schools and other learning contexts. [3]

EDUC 3620. Principles of Curriculum Development. Examining curriculum theory and practice on multiple levels in designing responsive curricula. Emphasis on understanding complex processes in curriculum development. [3]

EDUC 3630. Learning, Diversity, and Urban Studies, Seminar I. The Learning, Diversity, and Urban Studies Seminar I is designed to serve as a foundation for the master's program, Learning, Diversity, and Urban Studies (LDUS). Students in the LDUS program enroll in a yearlong seminar (Seminar I and II) that has been designed to build programmatic synergy and coherence among the central strands of the program (learning, diversity, and urban studies). To build programmatic coherence, students in the LDUS Seminar I will address some of the pertinent matters regarding in-school and out-of school teaching and learning. Essential topics of the course include race and equity in urban and diverse contexts, poverty, social class and stratification, teacher and student identity development, teachers and teaching in urban contexts, learning in urban contexts, curriculum development, and classroom management. [3]

EDUC 3640. Learning, Diversity, and Urban Studies, Seminar II. The Learning, Diversity, and Urban Studies Seminar II is a continuation of Seminar I and is designed to deepen students' knowledge related to learning, diversity, and urban studies. Students in the LDUS program have been exposed to a range of important matters related to learning, diversity and urban studies, and the goals of this second seminar are to assist students in expanding their knowledge and understanding related to some of the micro- and macro-level structures and systems that shape urban and highly diverse contexts. The seminar will expose students to the interplay between and among discourses related to policy, geography/social context, reform, and "achievement." While Seminar I was designed to assist students in understanding some broad, yet essential and fundamental, issues and perspectives related to diversity and urban studies, Seminar II is designed to help students deepen their knowledge and to situate and position themselves in ways that will allow them to (re)enter educational institutions and systems prepared to participate and transform them based on what they have come to know. [3]

EDUC 3690. Master's Thesis Research.

EDUC 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]

EDUC 3790. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

EDUC 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.

EDUC 3890. Individual Study in Education. Semi-independent study on selected topics in education. May be repeated. Consent of instructor required. [1-3]

EDUC 3900. Special Topics in Education. Explores special issues or topics related to education. May be repeated. [1-6]

EDUC 3911. Methods of Educational Research: Quantitative. Develops understandings of skills, principles, and techniques used in quantitative educational research. Approaches these topics under three headings: (1) identifying "good" research questions, (2) planning and designing a study to answer those questions, and (3) analyzing, interpreting, and presenting the results in a manner that contributes to knowledge and practice in education. [3] (Recommended for advanced doctoral students)

EDUC 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). [3] Recommended for advanced doctoral students)

EDUC 3930. Research in Education. Individual programs of research in various education fields. Consent of faculty supervisor required. May be repeated. [1-6]

EDUC 3931. Research in ELL Education. Individual programs of research in various education fields. Consent of faculty supervisor required. May be repeated. [1-6]

EDUC 3932. Research in Learning and Instruction. Individual programs of research in various education fields. Consent of faculty supervisor required. May be repeated. [1-6]

EDUC 3933. Research in Learning, Diversity and Urban Studies. Individual programs of research in various education fields. Consent of faculty supervisor required. May be repeated. [1-6]

EDUC 3934. Research in Reading Education. Individual programs of research in various education fields. Consent of faculty supervisor required. May be repeated. [1-6]

EDUC 3935. Research in ELL Education. Individual programs of research in various education fields. Consent of faculty supervisor required. May be repeated. [1-6]

EDUC 3990. Ph.D. Dissertation Research.

EDUC 3995. Half-Time Dissertation Research.

ENED 2920. Literature, Popular Culture, and New Media. Examines a wide range of multigenre, multimodal, and digital texts appropriate for readers of middle school and high school age. Considers the influence of popular culture and digital technologies on young adult literature. Includes materials and texts for readers of various ability levels. [3]

ENED 3000. Teaching Literature in Elementary Classrooms. Introduces students to the study of the field of children's literature and the principles of teaching literature in school settings. [3]

ENED 3007. Internship Seminar Secondary. Seminar to accompany EDUC 3002. [1]

ENED 3040. Perspectives on the English Language. Examines English linguistics and language history, explores multiple methods of teaching the grammar of Standard Written English, and of teaching vocabulary and spelling. For teachers and prospective teachers of English/language arts classes of grades five through twelve. [3]

ENED 3370. Teaching Literature and Media to Adolescents. Students study how pedagogy might be developed that connects traditional literature instruction with media popular cultural media. Methods and theories for reading and teaching short stories, poetry, and novels are juxtaposed and interwoven with methods and theories for reading and teaching web sites, comics, film, and other media. [3]

ENED 3380. Teaching Writing and Multimedia Composition. Explores contemporary composition as an activity that draws on a diverse palette of

media resources, while also being deeply connected to practices associated with traditional print. Emphasizes how teaching composition in print and new media, in parallel, can support student literacy development. [3]

ENED 3400. Reading and Learning with Print and New Media. Studies print and technology-based approaches to improving reading and content area learning in grades 6-12 with a special emphasis on diverse learners and struggling readers. Drawing on research-based practice, students learn to design, enact, and assess effective reading and literacy instruction. [3]

ENED 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. [3]

ENED 3890. Individual Study in English Education. Semi-independent study of selected topics in English education. Consent of supervising instructor required. May be repeated. [1-3]

ENED 3900. Special Topics in English Education. Exploration of special topics related to English education. May be repeated with change of topics. [1-3]

ENED 3930. Research in English Education. Individual program of research in English education. Consent of supervising instructor required. May be repeated. [1-6]

ENED 3960. Internship in English Education. Supervised on-site experience in a professional role. Interns serve as teachers, research associates, aides, or other members of professional teams. Consent of major professor required. [1-12]

FLED 2370. Teaching Foreign Language in Secondary Schools. Fundamentals of language learning and techniques of teaching foreign language in the secondary school. Required for secondary school licensure in a foreign language. Prerequisite: EDUC 2310 or consent of instructor. Corequisite: FLED 2360. [3]

MTED 3007. Internship Seminar Secondary. Seminar to accompany EDUC 3002. [1]

MTED 3200. Mathematical Concepts for Elementary Teachers. The course is designed for prospective elementary school mathematics teachers and focuses on the number and operations strand of the mathematics curriculum. The course is designed to deepen students' understanding of number and quantity, and to enable them to become familiar with the relevant strands of mathematics curricula. Children's quantitative reasoning and specific practices for supporting their learning are emphasized throughout the course. [2]

MTED 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. Corequiste EDUC 3280 and SCED 3250. [3]

MTED 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 candidates seeking initial licensure. Corequisite: MTED 2360. [3]

MTED 3810. Cognitive Theories of Mathematics Learning. 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, activity theory, and constructivism. [3]

MTED 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 levels. Considers the coordination of psychological and social perspectives in mathematics education and deals with the implications for the development of instructional activities. [3]

MTED 3890. Individual Study in Mathematics Education. Semi-independent study on selected topics in mathematics education. May be repeated. Consent of supervising instructor required. [1-3]

MTED 3900. Special Topics in Mathematics Education. Seminars, conferences, workshops, or field activities focused on current issues in mathematics education. May be repeated. [1-6]

MTED 3910. Investigations in the Teaching of Elementary School Mathematics. Study of current issues and research in mathematics education at the elementary school level. Emphasis on application to classroom instruction. [3]

MTED 3920. Investigations in the Teaching of Secondary School Mathematics. Research in literature of mathematics education at the secondary school level. [3]

MTED 3930. Research in Mathematics Education. Individual program of research in mathematics education. Consent of supervising instructor required. May be repeated. [1-6]

SCED 3007. Internship Seminar Secondary. Seminar to accompany EDUC 3002. [1]

SCED 3300. Investigations and Trends in Science Education. Survey of trends in science teaching and science curricula at the middle school and senior high school level. Emphasis on philosophies, teaching strategies, materials, and research associated with current curriculum practices. [3]

SCED 3370. Advanced Teaching of Science in Secondary Schools. A study of theory, research, issues, curriculum approaches, trends, and modern approaches to teaching science in secondary schools. Competencies that reflect effective science teaching practices will also be developed. Corequisite: SCED 2360. [3]

SCED 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]

SCED 3890. Individual Study in Science Education. Semi-independent study on selected topics in science education. May be repeated. Consent of supervising instructor required. [1-3]

SCED 3900. Special Topics in Science Education. Exploration of a special topic related to science education. May be repeated. [1-6]

SCED 3930. Research in Science Education. Individual program of research in science education. Consent of supervising instructor required. May be repeated. [1-6]

SSED 3007. Internship Seminar Secondary. Seminar to accompany EDUC 3002. [1]

SSED 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. Corequisite: SSED 2360. [3]

SSED 3890. Individual Study in Social Studies Education. Semi-independent study on selected topics in social studies education. May be repeated. Consent of supervising instructor required. [1-3]

SSED 3900. Special Topics in Social Studies Education. Explores special topics related to social studies education. May be repeated. [1-6]

Liberal Arts and Science

MLAS 260. Seminar In Humanities. Seminar In Humanities [3]

MLAS 270. Seminar In Social Science. Seminar In Social Science [3]

MLAS 280. Seminar In Natural Science. Seminar In Natural Science [3]

MLAS 290. Interdisciplinary Seminar. Interdisciplinary Seminar [3]

MLAS 310. Selected Topics In Humanities. Selected Topics In Humanities [3]

MLAS 320. Selected Topics in Social Science. Selected Topics in Social Science [3]

MLAS 330. Selected Topics in Natural Sciences. Selected Topics in Natural Sciences. [3]

MLAS 340. Interdisciplinary Selected Topics. Interdisciplinary Selected Topics. [3]

MLAS 369. Master's Thesis Research.

Management

MGT 311. Introduction to Financial Accounting. Studies the basic concepts and limitations of financial accounting. This course covers the financial reporting process and the development, interpretation, and analysis of financial statements for external users, such as investors and creditors. [2] Paul Chaney.

MGT 312. Introduction to Managerial Accounting. 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. Prerequisite: MGT 311. [2] Richard Willis.

MGT 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] David Parsley.

MGT 322. Managerial Economics. Teaches students to solve problems by (i) identifying profitable decisions using benefit-cost analysis, and (ii) ensuring that employees have enough information to make profitable decisions, and the incentive to do so. Specific topics include: investments, pricing, scale and scope economics, long-run strategy, price discrimination, bargaining, auctions, supply and demand, adverse selection, moral hazard, principal-agent relationships, and organizational design. [2] Luke Froeb.

MGT 331. Managerial Finance. Analyzes 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. [2] Bill Christie.

MGT 361. Marketing Management. Designed to introduce students to 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 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 they learn in class to current, "real world" marketing situations. [2] Steve Hoeffler.

MGT 371. Operations Management. An 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. [2] Mumin Kurtulus, Michael Lapré.

MGT 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

MGT 381. Managerial Statistics. Studies 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] Bruce Cooil.

MGT 399. Ph.D. Dissertation Research.

MGT 411B. Financial Accounting. This course provides students with refined tools to prepare, understand, and analyze financial statements. The fundamentals of assets, liabilities, and equities covered in MGT 311 will be reviewed, and the more complex issues surrounding these elements will be unpacked, analyzed, and interpreted. In addition, students will be exposed to the link between the economics of corporate transactions and how those transactions are accumulated, summarized, and reported in the financials of firms. The course considers the financial reporting framework that has been established by International Financial Reporting Standards but will primarily focus on the financial reporting standards established by the Financial Accounting Standards Board (US GAAP). By the completion of this course, students will be comfortable with the preparation of financial statements and the accompanying notes, as well as the economic implications of transactions that are included therein. Students will improve their familiarity with how accounting information is used to evaluate economic conditions and make organizational decisions. Prerequisite: MGT 311. [2] each. Debra Jeter, Nicole Jenkins.

MGT 412. Taxation of Business and Investment Transactions. Focuses on the fundamental concepts of federal income taxation that apply to business and financial transactions typical of most taxpayers, such as choice of business entity, measurement of taxable income (loss) from operations, acquisitions and dispositions of property, nontaxable exchanges, cost recovery, compensation and retirement planning, and investment and personal financial planning. The objectives of the course are not to make students "tax experts," but to educate them on the role taxes play in financial and managerial decision making, provide them with a working knowledge of those principles of tax law that are of wide application and importance, develop their intuition about the likely tax consequences of business and investment transactions, and begin developing in them an appreciation of tax planning as a process for maximizing wealth. Prerequisite: MGT 311. [2] William Henderson.

MGT 413. Advanced Management Accounting. Develops a student's ability to design financial systems focused on management needs for cost and revenue data. Students work with financial data to learn ways of creatively using the data to support a variety of management decisions. The course uses real world data and examples to illustrate the analysis of cost and revenue data for profit-maximizing decisions. Prerequisite: MGT 311. [2] Germain Böer.

MGT 417. Accounting Information Systems. The development and implementation of integrated organizational computer-based information systems has had a significant impact on the field of accounting. Accounting information systems must meet the multiple accounting needs of transaction processing, internal controls and audit, and financial statement preparation and simultaneously support the needs of decision makers in finance, operations, marketing, human resources, and strategic management. The Sarbanes-Oxley Act makes corporate executives explicitly responsible for establishing, evaluating, and monitoring the effectiveness of internal control over financial reporting. For most organizations, the role of IT will be crucial to achieving these objectives. This course presents system and control concepts necessary for the design, implementation, control, and audit of accounting information systems with an emphasis on the accounting cycle, database design requirements, information system controls, financial reporting, and management responsibilities for compliance. [2] Sal March.

MGT 422. Business and Society. Provides an introduction to the evolving role and responsibilities of business in the twenty-first century and the developing opportunities for business to address society's most pressing concerns. This course will overview the content and curriculum of two new courses at Owen-Corporate Responsibility and Sustainability (offered in Mods 2 and 4) and Social Entrepreneurship and Innovation (offered in Mod 3)-that have been developed by Professor Jim Schorr to build out Owen's curriculum offering in areas relating to the social and environmental areas of business. These areas are of growing importance in business today: nearly all leading companies have implemented substantive corporate responsibility and sustainability initiatives, while a growing movement of "social entrepreneurs" is successfully applying business solutions to society's most pressing social and environmental problems. The Business and Society short course will deliver a succinct but thorough overview of the ways in which the power of business is increasingly being leveraged to create a more socially and environmentally sustainable world. [1] Jim Schorr.

MGT 423. Corporate Responsibility and Sustainability. Explores this growing trend and its implications for business in today's world and beyond. "Environmental management" and "corporate social responsibility" have traditionally been viewed as necessary evils that add to the cost structure of business. In this old model, government regulations, threats of consumer boycotts, and other forms of coercive activities were the driving force behind compliance and socially responsible behavior. Many firms have begun to shed this old view of environmental and social issues and are embracing socially responsible behavior as a competitive strategy. We will explore what leading companies are doing in areas such as fair wages, privacy concerns, affirmative action, sexual harassment, employee rights, worker safety, consumer safety, animal testing, human rights, and environmental considerations. Particular attention is paid to understanding whether or not these activities provide firms with a competitive advantage in the marketplace. [2] Jim Schorr.

MGT 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: MGT 321. [2] Mikhael Shor.

MGT 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: MGT 331. [2] Nicolas Bollen.

MGT 432A. Corporate Valuation. This course focuses on providing students with a strong theoretical and applied understanding of the key tools used in equity valuation and stock selection. Approaches to valuation include dividend discount models, cash flow models, and valuation by multiples. Financial statement data are used in developing cash flow forecasts, and market data are used in estimating the cost of capital. The effects of firm financing policy, corporate taxes, and potential investment options are given special consideration. Applications include capital budgeting, the evaluation of potential mergers and acquisitions, and corporate restructuring. The objective of the course is to show how to manage companies to add value. Prerequisite: MGT 331. [2] Craig Lewis, Alexei Ovtchinnikov.

MGT 432B. Corporate Financial Policy. Examines major policies and financial decisions of a corporation. The topics considered are corporate governance and 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: MGT 432a. [2] Craig Lewis.

MGT 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: MGT 431. [2] Miguel Palacios.

MGT 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.

MGT 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: MGT 431. [2] Bob Whaley.

MGT 435B. Bond Markets. Explores the government, municipal, and corporate debt markets. Topics reviewed include the term structure of interest rates, interest rate risk, duration and convexity, and mortgage backed securities. Prerequisite: MGT 431. [2] Kate Barraclough.

MGT 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: MGT 431. [2] Kate Barraclough, Bob Whaley.

MGT 436. Financial Institutions. This course focuses on the managerial issues in banking and other financial services firms. It 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: MGT 431. [2] Lixiong Guo.

MGT 440. Strategic Alignment of Human Capital. The 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: MGT 342. [2] Tim Gardner.

MGT 441. Organization Design. Examines the effects of organization design on organizational learning and performance. Traditional as well as innovative designs for organizational structures and processes will be explored. Topics include the impact of environment, technology, culture, and power and politics on organizational design, and the emergence of new organizational designs. Prerequisite: MGT 342 [2] Rangaraj Ramanujam.

MGT 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 non-traditional 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. [2] Tim Gardner. (Offered every other year - not offered 2010/2011)

MGT 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.

MGT 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. Prerequisite: MGT 342. [2] Richard Daft.

MGT 445. Staffing. Staffing is the process by which organizations recruit, assess, place, and evaluate individuals at work. Students will develop a theoretical and practical understanding of labor law, job and competency analysis, internal and external recruitment, assessment methods (biodata, personality testing, performance testing, structured interviews, and assessment centers), and utility analysis. Emphasis will be placed in developing systems and procedures that are reliable, valid, legal, and useful. Prerequisite: MGT 342. [2] Tim Gardner.

MGT 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. Prerequisite: MGT 342. [2] Tim Gardner.

MGT 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. Prerequisite: MGT 342. [2] Ray Friedman.

MGT 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. Prerequisite: MGT 342. [2] Bruce Barry, Ray Friedman, Timothy Vogus.

MGT 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] Bruce Barry, Bart Victor.

MGT 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: MGT 361. [2] Jennifer Escalas.

MGT 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. Towards 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: MGT 361. [2] Jennifer Escalas.

MGT 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 best way to learn the material in this course (even for a marketing manager who may not actually engage in data analysis in the future) is through a "hands on" experience. Towards this end, students will design and implement a questionnaire, collect data, and analyze the data using statistical software. 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. The emphasis in this course will be on the interpretation and proper use of marketing research techniques, with the goal of training knowledgeable marketing managers who can evaluate the quality of marketing research conducted by others and use the information effectively in making strategic marketing decisions. [2] Jeff Dotson.

MGT 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: MGT 461b. [2] Dawn Iacobucci.

MGT 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 influ-

ence consumers toward a purchasing act (and oftentimes a non-act). 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: MGT 361. [2] Marketing faculty.

MGT 464. Sales Promotion and Personal Selling. This course equips students with the tools necessary to craft an effective integrated strategy for the promotion of goods and services. Students will learn about the variety of consumer- and trade-oriented sales promotions available to marketers and how to design such promotions for maximum sales as well as branding impact. The course will also consider how business success can be facilitated by a strong sales effort. To this end, the course will cover the role of selling in the broader marketing plan, as well as principles of successful selling. Sales promotion and selling are the two main foci of the course, but other integrated marketing communications tools will be covered including public relations, direct marketing, sponsorships, and merchandizing. Although the principles of effective advertising are exclusively covered in MGT 460, this course will cover optimal strategies for the integration of sales promotion and advertising, with particular focus on the life cycle of the brand. The course serves as a complement to MGT 460-neither course serves as prerequisite for the other. Prerequisite: MGT 361. [2] Steve Posavac.

MGT 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, forecasting, new product diffusion structures and rates, etc. Prerequisite: MGT 361. [2] Mark Ratchford.

MGT 468. Brand Management. A business thrives or withers as a function of the health and success of its brands. This course will give students the tools to develop and execute effective brand strategies in the aim of building and maintaining strong brands that endure over time, and that can withstand competitive threats. Emphasis will be given to category management, and students will learn how to develop and position product lines, when (and when not) to pursue brand extensions, and the principles of creating, preserving, and leveraging brand equity. Prerequisite: MGT 361. [2] Steve Posavac.

MGT 472. Supply Chain Management and Information. An 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: MGT 371. [2] Mumin Kurtulus.

MGT 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: MGT 371. [2] Michael Lapré.

MGT 480. Business Forecasting. Includes smoothing methods, multiple regression, and ARIMA models. Statistics elective. Prerequisite: MGT 381. [2] Bruce Cooil.

MGT 490. Enterprise Resource Planning. Enterprise resource planning 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. There will be a number of case studies, many of them led by members of the class. [2] Bob Blanning.

MGT 491. Decision Support Systems. Provides experience in the construction of DSS that support individual and organizational decision processes. The focus is on two types of DSS. The first is intelligent DSS, and especially rule-based systems. The second is group DSS for conducting collaborative work and executive information systems. [2] Bob Blanning.

MGT 492. Data Management and Business Intelligence. Introduces the principles of database management system development and use including an overview of different data models, and methods for conceptual, logical, and physical design of databases. Issues in database administration and advances in database technology (distributed databases, knowledge base systems, heterogeneous databases) are also addressed. [2] Sal March.

MGT 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, to program in JavaScript, and to script Web pages using Dreamweaver. [2] Bob Blanning.

MGT 511. Advanced Financial Reporting and Analysis. Examination of the nature and financial reporting aspects of various business transactions including corporate acquisitions, mergers, the formation of other strategic alliances, and accounting for governmental entities. Topics include accounting for business combinations and consolidations, joint ventures, and foreign currency translation, variable interest entities, derivatives and hedge accounting, and financial reporting under Governmental Accounting Standards. Prerequisite: MGT 411. [2] Nicole Jenkins.

MGT 512. Taxation of Corporations and Shareholders. Focuses on the fundamental concepts of federal income taxation that apply to corporations and shareholders. A "cradle to grave" organizational approach is used, emphasizing organization and capital structure of the corporation, dividends and other distributions, stock redemptions, corporate divisions, taxable and tax-free mergers and acquisitions, and liquidation of the corporation. The objectives of the course are not to make students "tax experts," but to sensitize them to the tax implications of transactions involving corporations and shareholders so that, as business managers, entrepreneurs, or advisers, they can spot the tax concerns or opportunities, identify the major tax issues, ask good questions of the "tax experts," and understand the answers received as a critical step in making business and financial decisions that maximize wealth. Prerequisite: MGT 311, 331. MGT 412 is highly recommended. [2] William Henderson.

MGT 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 not only 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 analysis 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. Pre- or corequisite: MGT 411 (can be taken concurrently). [2] Charles Kile.

MGT 514. Taxation of Joint Ventures, Partnerships, and other "Flow-Through" Entities. Focuses on the fundamental concepts of (1) federal income taxation of "flow-through" entities, such as the joint venture, partnership, LLC, and S corporations; (2) the federal gift and estate taxes; and (3) family tax planning. A "cradle to grave" approach is used for "flow-through" entities, emphasizing their formation, operation, sale or exchange, and liquidation. Gift and estate tax topics include transfers subject to tax, valuation, exclusions, credits, procedural matters, and computation of tax. Family tax planning topics include minimizing gift, estate, and income taxes; valuation of specific assets; and estate liquidity. The objectives of the course are not to make students "tax experts," but to educate them on the role taxes play in making good decisions; provide them with a working knowledge of those principles of tax law that are of wide application and importance; and develop their appreciation of tax planning as a process for maximizing wealth. Prerequisite: 311. [2] Henderson.

MGT 518. Accounting and Finance for Entrepreneurs. Covers the accounting and financial issues faced by rapidly growing start-up firms. It deals with accounting systems, cash planning systems, and financial issues managers must handle for the firm as it grows its annual sales from zero to 20 million. Prerequisite: MGT 311. [2] Germain Böer.

MGT 519. Accounting and Financial Communication. This course provides students with the tools to understand, to analyze, and to create the financial information used to evaluate a firm. Complex transactions, financial reporting crises, and firm communication choices will be broken down into approachable components, building on accounting knowledge learned in the core Introduction to Accounting course. Students will develop an understanding of the external users of financial information, such as investors, customers, analysts, and the financial media. By the completion of this course, students will have increased their knowledge of technical accounting to an intermediate/advanced level. This will allow students to effectively analyze accounting and financial information from a user's perspective and to employ financial information as part of a broad communication strategy to enhance the effectiveness of a firm. Prerequisite: MGT 311. [2] Nicole Jenkins.

MGT 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] Dewey Daane.

MGT 526. Corporate Strategy. Focuses on the challenges of formulating corporate-level strategies and their implementation. In contrast to business-level strategy, which addresses competitive advantage in a single market or industry, we analyze how competitive advantage can be created through the configuration and coordination of activities across multiple markets and industries. As part of the course, distinctive challenges that face multinational corporations are also discussed. Students will gain experience in discovering, diagnosing, and solving corporate-level problems including corporate diversification, strategic alliances, multi-market interaction, and global strategies. Prerequisite: MGT 355. [2] Brian McCann.

MGT 530. Mergers and Acquisitions. Covers some of the major corporate finance activities of investment banks including: mergers and acquisitions, and takeovers and takeover defenses, as well as private financing, asset restructuring, capital restructuring, leveraged buyouts, management buyouts, and leveraged recapitalizations. This course is meant to familiarize students with institutional details and to present 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: MGT 432a. [2] Ron Masulis.

MGT 531. Venture Capital. 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, 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 to discuss how the legal environment at the time of the case affects their recommendations. Prerequisite: MGT 432a. [1 - short course] Ron Masulis.

MGT 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: MGT 435b, 435c. [2] Clifford Ball.

MGT 534. Financial Data Analysis. Introduces students to the many databases used in empirical research in finance, including CRSP, Compustat, TAQ (NYSE, Amex, and Nasdaq-NMS transaction data) and NASTRAQ (Nasdaq trades, inside quotes, and individual dealer and ECN quotes). The course will use the SAS programming language to access these databases and to analyze the data. Basic Fortran programming will also be presented to familiarize students with CRSP/Compustat access programs. The course is intended for Ph.D. students and MBAs who are interested in more analytically oriented finance positions. Prerequisite: MGT 431. [2] Christoph Schenzler.

MGT 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: MGT 435c. [2] Christian Schlag.

MGT 536. Active Portfolio Analysis. Takes the perspective of a quantitatively oriented equities portfolio manager. It 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. The course is designed for very quantitatively oriented students. [2] Rick Cooper.

MGT 539F. Special Topics in Accounting: Federal Income Taxation of Mergers and Acquisitions. 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: MGT 311, 331. [2] William Henderson.

MGT 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. Prerequisite: MGT 342. [2] Richard Daft.

MGT 544. 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. Prerequisite: MGT 342. [2] Bruce Barry.

MGT 549F. Doing Business in China. Provides an overview of Chinese history, culture, and economic structure, and examines issues faced by foreign companies in China as well as strategic choices facing Chinese companies. Topics include entry into Chinese markets, choice and assessment of potential partnerships, management of partner relationships and employees, sourcing products from China, and the effects of cultural and economic developments on business practices. The course is designed both for students who know little about China and those with longstanding interest in China. [2] Ray Friedman.

MGT 560. Marketing Strategy. Builds on the strategic groundwork laid in core marketing and offers students an opportunity to apply their marketing strategy skills. Students will compete in an elaborate, multi-period marketing simulation (Markstrat). As in the real market, there will be winners and losers, and students' grades will be based partially on how well they perform against competitors in this simulation. In addition, the course will introduce research on special topics such as scenario planning and competitive conjectures. Prerequisite: MGT 361. [2] Mark Ratchford.

MGT 562. Customer Relationship Management. Provides an introduction to the study of customer satisfaction and customer relationship management. Topics addressed included satisfaction measurement, linking satisfaction to firm performance, customer profitability and lifetime value, and predictive analytics for database marketing. This course is taught from a quantitative perspective, with particular emphasis placed upon measuring (and ultimately optimizing) the behavioral and financial impact of customer satisfaction and loyalty programs. To this end, a variety of data analysis techniques will be utilized throughout the term, including logistic regression, simulation, and optimization. Measurement (survey) methods and issues are also an integral focus of the course. Prerequisite: MGT 460 or 462 or consent of instructor. [2] Jeff Dotson.

MGT 565. Internet Marketing Strategy. This covers the fundamentals of Internet Marketing, Search Engine Marketing, E-mail Marketing, E-Commerce Promotions and Online Merchandising. We'll cover topics such as working with interactive agencies, structuring Internet business development deals, creating online promotional campaigns, tracking and reporting online marketing initiatives, budgeting and forecasting for online customer acquisition efforts, user interface and design strategies, and understanding key drivers of success for affiliate marketing, search engine marketing, e-mail marketing, and new and upcoming forms of online marketing within virtual worlds, online gaming, and social media. Prerequisite: 361. [2] Cleek.

MGT 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: MGT 355, 361. [2] Mikhael Shor.

MGT 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: MGT 371. [2] Nancy Lea Hyer.

MGT 612. Research Seminar in Accounting. Prerequisite: Consent of instructor. [Variable credit] Staff.

MGT 615. Independent Study in Accounting. Prerequisite: Consent of instructor. [Variable credit] Staff.

MGT 630A. Asset Pricing Theory. 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. Consent of instructor required to enroll. This is a doctoral level class. [2] Jacob Sagi.

MGT 630B. Corporate Finance Theory. This course uses state preference theory to develop single period theories of optimal investment and optimal capital structure. We explore models of adverse selection and moral hazard and use 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.

MGT 631A. Empirical Methods in Finance A. This is the first of two courses that examine the recent empirical developments in financial economics. It focuses on topics in financial markets such as market efficiency, market models, arbitrage pricing models, inter-temporal equilibrium models, and market microstructure. Theoretical foundations are developed; empirical research evidence is considered; applications of models are stressed. Prerequisite: 630a, 630b. [2] Alexei Ovtchinnikov.

MGT 631B. Empirical Methods in Finance B. This is the second of two courses that examine the recent empirical developments in financial economics. It 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.

MGT 632. Advanced Finance Theory. Covers an advanced treatment of finance theory. Topics include utility theory, arbitrage and pricing, equilibrium models and complete markets, inter-temporal models, continuous time finance, contingent claim pricing, and the term structure of interest rates. Prerequisite: 630a, 630b. [4] Staff.

MGT 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, and permission of instructor. [2] Staff.

MGT 636. Research Seminar in Finance. Corporate Governance. Prerequisite: Consent of instructor. [Variable] Ronald Masulis.

MGT 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.

MGT 643A. 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.

MGT 643B. 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.

MGT 643C. Doctoral Seminar in Organization Studies. Prerequisite: Consent of instructor. [Variable] Staff. (Doctoral Level HOP)

MGT 643D. 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.

MGT 645. Independent Study in Organization Studies. Prerequisite: Consent of instructor. [Variable] Staff.

MGT 662. Research Seminar in Marketing. Examines current research topics and areas of research interest in marketing. The fall seminar emphasizes methodological topics, and the spring seminar emphasizes substantive topics. Journal articles, working papers, and book chapters are studied in depth. The format is a combination of lecture and seminar. Prerequisite: Consent of instructor. [Variable]

MGT 665. Independent Study in Marketing. Prerequisite: Consent of instructor. [Variable] Staff.

MGT 672. Research Seminar in Operations. Prerequisite: Consent of instructor. [Variable] Staff.

MGT 675. Independent Study in Operations Management. Prerequisite: Consent of instructor. [Variable] Staff.

MGT 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. Consent of instructor required to enroll. [2] Clifford Ball.

MGT 682. Research Seminar in Quantitative Analysis. Prerequisite: Consent of instructor. [Variable] Staff.

MGT 685. Independent Study in Quantitative Analysis. Prerequisite: Consent of instructor. [Variable] Staff.

Mathematics

MATH 200. Intensive Problem Solving and Exposition. Intended to develop widely-applicable mathematical skills. Basic principles such as induction, the pigeonhole principle, symmetry, parity, and generating functions. [3]

MATH 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. Corequisite: 175. Credit is not given for both 204 and 194 or 205a–205b. [3]

MATH 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 or 198. [3]

MATH 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. [3]

MATH 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. Prerequisite: multivariable calculus. No credit for students who have completed 218. [3]

MATH 218. Introduction to Probability and Mathematical Statistics. Discrete and continuous probability models, mathematical expectation, joint densities. Laws of large numbers, point estimation, confidence intervals. Hypothesis testing, nonparametric techniques, applications. Students taking 218 are encouraged to take 218L concurrently. Prerequisite: multivariable calculus. No credit for students who have completed 216. [3]

MATH 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. [1]

MATH 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, 2n designs, fractional factorials, confounding, introduction to response surface methodology. Applications will be emphasized. Prerequisite: 218 or equivalent. [3]

MATH 221. Theory of Numbers. Factorization of integers, Fundamental Theorem of Arithmetic, congruences, Wilson's theorem. Fermat's theorem, arithmetic functions, perfect numbers, Law of Quadratic Reciprocity. Diophantine equations, Pythagorean triples, sums of squares. [3]

MATH 223. Abstract Algebra. Fundamental properties of integers and polynomials. Elementary properties of groups, rings, integral domains, fields, and lattices. Prerequisite: linear algebra. [3]

MATH 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. [3]

MATH 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. [3]

MATH 234. Introduction to Partial Differential Equations. Initial-and boundary-value problems for partial differential equations using separation of variables in conjunction with Fourier series and integrals. Explicit solutions of problems involving the heat equation, the wave equation, and Laplace's equation. Prerequisite: ordinary differential equations, linear algebra. [3]

MATH 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. [3]

MATH 242. Introduction to Topology. Continuity, compactness, and connectivity. Topology of surfaces, triangulations, and the fundamental group. Basic ideas of graph theory, vector fields, and Euclidean and hyperbolic geometry. [3]

MATH 243. Differentiable Manifolds. Manifolds in n-dimensional Euclidean space, smooth maps; inverse and implicit function theorems. Regular value theorem, immersions and submersions, Sard's theorem, and transversality. Degree of a map; winding numbers and the Fundamental Theorem of Algebra; intersection theory modulo 2. Prerequisite: multivariable calculus, linear algebra. [3]

MATH 246a. Introduction to Actuarial Mathematics. Applications of calculus and probability to actuarial science. The foundations of financial mathematics, including the theory of interest. Prerequisite: multivariable calculus. Corequisite: 216, 218, or 247. [3]

MATH 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. [3]

MATH 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. [3]

MATH 248. Mathematical Statistics. Distribution theory, order statistics, theory of point estimation and hypothesis testing, normal univariate inference, Bayesian methods, sequential procedures, regression, nonparametric methods. Students interested in applications may take 218L. Prerequisite: 247. [3]

MATH 250. Introduction to Mathematical Logic. Development of the first order predicate calculus and fundamental metamathematical notions. [3]

MATH 252. History of Mathematics. Major developments in mathematics from ancient times to the early 20th century. Emphasis both on the historical perspective and the mathematics; assignments include many exercises and theorems. Prerequisite: multivariable calculus, and either linear algebra or 223. Especially recommended for teacher candidates. [3]

MATH 253. Error-Correcting Codes and Cryptography. Applications of algebra to reliability and secrecy of information transmission. Error-correcting codes, including linear, Hamming, and cyclic codes, and possibly BCH or Reed-Solomon codes. Cryptography, including symmetric-key, DES and RSA encryption. Prerequisite: linear algebra. [3]

MATH 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. [3]

MATH 259. Advanced Calculus. Advanced treatment of multivariable calculus. Differentiation of functions of several variables, including inverse and implicit function theorems. Vector differential calculus. Integration of functions of several variables. Vector integral calculus, including Stokes' theorem. Prerequisite: multivariable calculus and linear algebra. [3]

MATH 260. Introduction to Analysis. Properties of real numbers, compactness and completeness. 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 advanced mathematics courses. [3]

MATH 261. Complex Variables. Complex numbers, analytic and elementary functions, transformations of regions. Complex integrals, Cauchy's integral theorem and formula, Taylor and Laurent series. The calculus of residues with applications, conformal mappings. Prerequisite: multivariable calculus. [3]

MATH 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. [3]

MATH 270. Differential Topology. Manifolds; submanifolds; tangent and vector bundles. Vector fields and flows, Lie brackets, distributions, and the Frobenius theorem. Sard's theorem; transversality and intersection theory; degree theory and applications. Tensors and differential forms; the exterior derivative; Stokes' theorem and integration; de Rham cohomology. Prerequisite: linear algebra and either 242 or 272a. [3]

MATH 272a. Topology. Connectedness, compactness, countability, and separation axioms. Complete metric spaces. Function spaces. [3]

MATH 272b. Topology. The fundamental group and covering spaces. Topology of surfaces. Simplicial complexes and homology theory. Homotopy theory. Prerequisite: 242. [3]

MATH 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). Students unfamiliar with permutations, combinations, and basic counting techniques should take 215 prior to 274. [3]

MATH 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 in surfaces, especially the plane. Prerequisite: linear algebra. Students unfamiliar with basic ideas of graph theory, including paths, cycles, and trees, should take 215 prior to 275. [3]

MATH 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: multivariable calculus and linear algebra. [3]

MATH 283a. Modern Algebra. Group theory through Sylow theorems and fundamental theorem of finitely generated abelian groups. Prerequisite: linear algebra. An elementary course in modern algebra (e.g., 223) is strongly recommended. [3]

MATH 283b. Modern Algebra. 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]

MATH 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]

MATH 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. [3]

MATH 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 (CS 101 or 103). [3]

MATH 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 (CS 101 or 103). [3]

MATH 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]

MATH 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: ordinary differential equations. [3]

MATH 297. Selected Topics. Topics of special interest. [Variable credit: 1–3 each semester, total of all 267 and 297 courses not to exceed 12 credits]

MATH 298. Independent Study. Reading and independent study in mathematics under the supervision of an adviser. Designed primarily for honors candidates, but open to others with approval by department chair. [Variable credit: 1–3 each semester, not to exceed 6 without departmental permission]

MATH 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]

MATH 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]

MATH 312. Algebraic Topology. Homology, cohomology, homotopy theory. Prerequisite: 272a–272b. [3]

MATH 313. Riemannian Geometry. Vector fields, brackets; Riemannian metrics; Riemannian connections; geodesic flow; curvature: sectional curvature, Ricci curvature, scalar curvature; Jacobi fields; Hopf-Rinow Theorem; Hadamard Theorem. Complex manifolds, Hermitian metrics, Kahler metrics, complex projective space, first Chern class of a line bundle. Prerequisite: 270. [3]

MATH 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. [3]

MATH 324a. 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]

MATH 324b. Combinatorial and Geometric Group Theory. Continuation of 324a. 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]

MATH 325. Introduction to Approximation Theory. Best approximation in metric and normed vector spaces; Tchebycheff 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]

MATH 330a. 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]

MATH 330b. Theory of Functions of a Real Variable. Continuation of 330a. 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]

MATH 331a. 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]

MATH 331b. Theory of Functions of a Complex Variable. Continuation of 331a. 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]

MATH 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. [3]

MATH 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]

MATH 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]

MATH 360. Harmonic Analysis. Fourier series; Wiener's Lemma; Fourier integral; Plancherel Theorem; Haar measure on an LCA group G, Dual group and the Fourier integral; Hausdorff-Young inequality; Hilbert transform; Hardy-Littlewood maximal functions; Marcinkiewicz Interpolation theorem; Singular integrals and the Calderon-Zygmund decomposition; multiresolution approximations; special topics from harmonic analysis, such as wavelets, frames, abstract harmonic analysis, symmetric spaces. Prerequisite: 330a-330b. [3]

MATH 362a. 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. [3]

MATH 362b. Functional Analysis. Continuation of 362a. Function spaces, topological vector spaces, linear operators, conjugate spaces, Hilbert and Banach spaces, Banach algebras. Applications to function theory, differential equations, and integral equations. [3]

MATH 364a. Nonlinear Differential Equations and Analytical Dynamics. 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. [3]

MATH 364b. Nonlinear Differential Equations and Analytical Dynamics. Continuation of 364a. 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]

MATH 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. Prerequisites: 330B, 362A. [3]

MATH 367. Selected Advanced Topics. Topics of special interest at a level suitable for graduate students in mathematics. [Variable credit: 1–3]

MATH 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. [Variable credit: 1–3]

MATH 369. Master's Thesis Research.

MATH 372a. Seminar in Topology. Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester]

MATH 372b. Seminar in Topology. Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester]

MATH 375a. Seminar in Graph Theory. Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester]

MATH 375b. Seminar in Graph Theory. Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester]

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

MATH 381a. Seminar in Number Theory. Recent topics. Depending on variation of topics, this course may be repeated. [Variable credit: 1–3 each semester]

MATH 381b. Seminar in Number Theory. Recent topics. Depending on variation of topics, this course may be repeated. [Variable credit: 1–3 each semester]

MATH 383a. Seminar in Algebra. Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester]

MATH 383b. Seminar in Algebra. Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester]

MATH 385a. Seminar in Approximation Theory. Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester]

MATH 385b. Seminar in Approximation Theory. Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester]

MATH 386. Seminar in Computational Mathematics. Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1-3 each semester]

MATH 390a. Seminar in Analysis. Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester]

MATH 390b. Seminar in Analysis. Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester]

MATH 394a. Seminar in Applied Analysis. Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester]

MATH 394b. Seminar in Applied Analysis. Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester]

MATH 395a. Seminar in Mathematical Biology. Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester]

MATH 395b. Seminar in Mathematical Biology. Recent topics. (Depending on variation of topics, this course may be repeated.) [Variable credit: 1–3 each semester]

MATH 398. Directed Study. A reading course designed to give graduate students more background. [Variable credit: 1–3 each semester]

MATH 399. Ph.D. Dissertation Research.

Mechanical Engineering

ME 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]

ME 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: ME 190, Math 198. SPRING. [3]

ME 260. Energy Conversion I. Energy resources, use, and conservation are studied. The fundamentals of positive displacement machinery, turbomachinery, and reactive mixture are introduced and used to examine various forms of power-producing systems. Prerequisite: ME 220a, ME 224. FALL. [3]

ME 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: ME 224. FALL. [3]

ME 262. Environmental Control. A study of heating and cooling systems, energy conservation techniques, use of solar energy and heat pumps. Prerequisite: ME 220a; corequisite: ME 248. SPRING. [3]

ME 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: ME 224. SPRING. [3]

ME 264. Internal Combustion Engines. A study of the thermodynamics of spark ignition and compression ignition engines; gas turbines and jet propulsion. Prerequisite: ME 220a. SPRING. [3]

ME 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. Prerequisite: ME 220a. SPRING. [3]

ME 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: ME 224, ME 220a. SPRING. [3]

ME 271. Introduction to Robotics. (Also listed as EECE 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 194. FALL. [3]

ME 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]

ME 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: ME 190 and Math 198. FALL. [3]

ME 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: ME 234. FALL. [3]

ME 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: ME 220a. SPRING. [3]

ME 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: ME 263 or equivalent. SPRING. [3]

ME 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: ME 263 or equivalent. SPRING. [3]

ME 326. Gas Dynamics. Study of compressible fluid flow from subsonic to supersonic regimes in confined regions and past bodies of revolutions. Includes heat transfer, frictional effects, and real gas behavior. Prerequisite: ME 224. SPRING. [3]

ME 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]

ME 331. Robot Manipulators. (Also listed as EECE 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: ME 271. SPRING. [3]

ME 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]

ME 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 ME 236 or ME 336. Prerequisite: ME 234. FALL. [3]

ME 343. High-Performance Computing for Engineers. (Also listed as CS 343) Introduction to high-performance computing. Engineering applications. Focus on high-speed cluster computing. Class project applying high-performance computing to various research topics. Prerequisite: Introductory programming class or consent of instructor. FALL. [3]

ME 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: ME 248, ME 325a. SPRING. [3]

ME 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: ME 336. SPRING. [3].

ME 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]

ME 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. Significant laboratory component with design and fabrication circuits to control electromechanical systems. Implementation of digital controllers. Prerequisite: ME 234. FALL. [3]

ME 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: ME 259; Math 234, Math 294. SPRING. [3]

ME 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: ME 248. SPRING. [3]

ME 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]

ME 366. Combustion. Introduction to combustion processes. Topics include combustion thermodynamics, chemical kinetics, premixed flame theory, diffusion flame theory, ignition and detonation. Prerequisite: ME 220b, ME 224. SPRING. [3]

ME 369. Master's Thesis Research.

ME 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit 0-12]

ME 389. Master of Engineering Project.

ME 391. Special Topics. A course based on faculty research projects and highly specialized areas of concentration. [Variable credit: 1-3 each semester]

ME 392. Special Topics. A course based on faculty research projects and highly specialized areas of concentration. [Variable credit: 1-3 each semester]

ME 393. 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]

ME 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]

ME 397. Seminar. Seminar. [0]

ME 398. Seminar. Seminar. [0]

ME 399. Ph.D. Dissertation Research.

ME 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

MHS 202. Perspectives on Global Public Health. Global issues in public health. Focus on ecological approaches. [3]

MHS 203. U.S. Public Health Ethics and Policy. Critical perspectives on ethical and policy issues in U.S. public health. [3]

MHS 225. Death and Dying in America. Interdisciplinary introduction to thanatology; changes in medicine and attitudes towards dying as they reshape the American way of death in a multicultural landscape. [3]

MHS 230. Early Medicine and Culture. Health, healing, disease, and the body from antiquity to the Enlightenment. [3]

MHS 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]

MHS 305. Foundations in Global Health. Determinants of health and interventions used to better health, particularly in low-resource settings. Core research and evaluation methodologies used in the field. [3]

MHS 369. Master's Thesis Research.

MHS 390a. 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. [3]

MHS 390b. Independent Study. A program of independent readings and research in a minimum of two disciplines, to be selected in consulta-

tion with a faculty adviser and subject to the approval of the CMHS director. [3]

MHS 393a. Internship Training. Must be taken concurrently with 393b and/or 393c.

MHS 393b. Internship Research. Students will write a substantial research paper under the supervision of a Vanderbilt faculty member. [3]

MHS 393c. Internship Readings. Readings and a substantial interpretive essay on topics related to the internship training, under the supervision of a Vanderbilt faculty member. [3]

MHS 394a. Graduate Service Learning. Must be taken concurrently with 394b and/or 394c. After completing the experience, all students must write a thorough report. [1–3].

MHS 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. [3]

MHS 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. [3]

MHS 398. Master's Thesis Research. [0]

Microbiology and Immunology

M&IM 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] Aiken.

M&IM 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.

M&IM 333. Foundations in Microbiology and Immunology II. Second semester of required course work. Original research articles focus on virology. FALL. [3] Ruley and Staff.

M&IM 334. Foundations in Microbiology and Immunology III. Third semester of required course work. Original research articles focus on immunology. SPRING. [1] Boothby and Staff.

M&IM 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 the faculty thesis mentor and a course instructor. 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. A student and a faculty member 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), Ruley, Cover.

M&IM 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 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.

M&IM 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.

M&IM 352. Special Topics in Hiv/Aids Research. This advanced course reviews recent progress in AIDS research as a platform for discussions of current research frontiers, with an emphasis on molecular interactions of the virus with host cells. Prerequisite: a graduate-level course in virology or immunology. SPRING. [3] Aiken.

M&IM 369. Master's Thesis Research.

M&IM 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 discredited 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.

M&IM 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

M&IM 399. Ph.D. Dissertation Research.

M&IM 3282. Molecular Virology. The interaction of animal viruses with their host cells, discussed at the molecular and cellular level as model systems. Special emphasis is placed on current literature and methodology. Prerequisite: IGP 300 or an undergraduate course in biochemistry or microbiology. FALL. [3] Aiken/Dermody and Staff.

M&IM 3283. 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 300 or any microbiology course. FALL. [3] Staff.

M&IM 3284. 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 seven 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.

Molecular Physiology and Biophysics

MP&B 322. Physiological Techniques and Preparations. Students sign up for this course number for research credits prior to admission into candidacy for Ph.D. degree. FALL, SPRING, SUMMER. Hours and credit by arrangement. Cone and Staff.

MP&B 323. Advanced Neurophysiology. (Also listed as Pharmacology 323 and Neuroscience 324) This class is a tutorial in methods for recording electrical signals in neurons. We will begin with a crash course on ion channels and transporters, spending a significant proportion of class time on discussion of recent primary research papers. In the latter part of the semester, we will move on to live demonstrations and personal training in the details of electrophysiological recording methods in several preparations. By the end of the course, students will be prepared to perform electrophysiological experiments as part of their dissertation research. SPRING. [3] Galli.

MP&B 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 in preparation for their Candidacy Examination. FALL, SPRING. [1] Hasty, Kenworthy, Colbran, Stein, and Staff.

MP&B 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] Hutson.

MP&B 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.

MP&B 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, Cone, O'Brien, Hasty, Niswender.

MP&B 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.

MP&B 329. Experimental Statistics Short Course. The goal of this course is to insure basic proficiency in statistical concepts, methods for analysis of experimental data, and enhance statistical communication skills. Core concepts to be discussed are: (1) Sources of data variation, data types that lead to different analyses (e.g. parametric vs nonparametric); (2) Variation in samples and populations, real world vs theoretical data distributions; (3) Importance and use of confidence intervals, effect size, power related to experimental design; (4) Meaning of statistical vs functional significance; and (5) Aspects of data analysis pitfalls (e.g., outliers, multiple tests, clustered data). Prerequisite: Permission of faculty. Summer [1]

MP&B 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.

MP&B 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 from students. All class sessions revolve around the detailed discussions of assigned reading materials and require students to perform extensive reading of the original research literature. The topics to be covered include eukaryotic RNA polymerase structure and function, functional and physical mapping of cis-acting regulatory elements, chromatin and nucleosome 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, techniques, data interpretation, and formulation of future experimentation in these areas. Prerequisite: comprehensive undergraduate-level courses in biochemistry, molecular biology, and/or molecular genetics; IGP Bioregulation I. SPRING. [2] Weil and Staff.

MP&B 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. Each lecture will be presented by faculty followed by a discussion of a research paper on a related topic led by a current IGP student. 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-FEBRUARY. [1] O'Brien and Staff.

MP&B 340. Human Genetics I. (Also listed as Human Genetics 340) Designed to cover background and latest advances in human molecular genetics. Topics will include an overview and in-depth look at molecular genetics including DNA, RNA, and chromosome basics. Gene structure and transcriptional processing. Mutational mechanisms, biochemical genetics (gene defects in biochemical pathways). Topics will be discussed with use of real-world examples and relevance to human research. FALL. [3] Summar, Mortlock, and Staff.

MP&B 341. Human Genetics II. (Also listed as Human Genetics 341) 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, disease gene discovery (emphasizing design, statistical and molecular techniques), 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.

MP&B 345. Cellular and Molecular Neuroscience. (Also listed as Cell 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.

MP&B 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.

MP&B 369. Master's Thesis Research.

MP&B 370. Tutorials in Human Genetics. A weekly seminar critically evaluating current and past scientific literature focusing on study design and molecular genetics. The focus will be on study methods and analysis. FALL. [1] Canter and Kearney.

MP&B 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.

MP&B 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

MP&B 381. Molecular Foundations of Medicine. Molecular Foundations of Medicine is designed to familiarize students with the cellular structures, biomolecules, and processes that constitute life, human health, and disease at the molecular level. The course employs an integrated approach to teach underlying principles of biochemistry, cell and tissue biology, and genetics with an emphasis on human systems and medical conditions. The inclusion of clinical correlation sessions, small groups, and laboratory sessions will further integrate and broaden course material and relate molecular processes to the study of human disease. Prerequisite: MSTP students only. FALL. [Variable credit: 1-5] Osheroff, George, Pettepher.

MP&B 382. Structure, Function, and Development. Structure, Function, and Development is designed to provide students with the means to develop an effective understanding of the normal micro and macroscopic structure, function, and development of the human body. The course employs a coordinated, integrated approach to the presentation and learning of the disciplines of human gross anatomy, cell and tissue biology (histology), human development (embryology), and physiology in a context of clinical application. Prerequisite: MSTP students only. SPRING. [Variable credit: 1-4] Dalley, Strom, Pettepher.

MP&B 384. The Brain and Behavior. Brain and Behavior provides a basic understanding of the human central nervous system and human behavior. The format includes lectures, lab exercises, small group discussions, and patient and case presentations. Brain and Behavior integrates three areas of medical science: (1) neuroanatomy, physiology, and biochemistry; (2) psychopathology and systems neuroscience; and (3) pathology, pharmacology, and radiology. Prerequisite: MSTP students only. SPRING. [Variable credit: 1-2] Norden, Heckers.

MP&B 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.

MP&B 399. Ph.D. Dissertation Research. This course is used for research following entry into Ph.D. candidacy (following successful completion of the Candidacy Examination).

Music

MUSC 341A. Intensive Musicianship I. Intensive immersive musical instruction modeled on language acquisition process, designed to provide musicians with practical skills in real-time aural processing, including interval identification, reading and notating pitch and rhythm, facility in each of the diatonic modes, aural tracking of multiple simultaneous parts. Open by instructor approval. SUMMER. [1] Ploger.

MUSC 341B. Intensive Musicianship II. Intensive immersive musical instruction modeled on language acquisition process, designed to provide musicians with practical skills in real-time aural processing, including interval identification, reading and notating pitch and rhythm, facility in each of the diatonic modes, aural tracking of multiple simultaneous parts. Open by instructor approval. SUMMER. [1] Ploger.

MUSC 342. Intensive Musicainship III. Continuation of materials covered in Intensive Musicianship 341A-B, including further real-time aural processing, with discussion of pedagogical approaches to teaching musicianship using a language-acquisition model. Prerequisite: 341 B. SUMMER. [1] Ploger.

Neuroscience (NSC)

NSC 201. Neuroscience. (Formerly Psychology 201). Physiology of nerve cells, sensory and motor systems, sleep, speech, and sexual behavior. Clinical topics include the chemical basis of psychosis, diseases of the brain, and repair mechanisms after brain injury. Serves as repeat credit for students who completed PSY 201 prior to fall 2008. [3]

NSC 235. Biological Basis of Mental Disorders. (Formerly Psychology 235). Suicidal behavior, mood and anxiety disorders, schizophrenia, alcoholism, and sexual dysfunction. Effects of drug abuse on brain chemistry. Organic diseases such as epilepsy, AIDS, and stroke as causes of cognitive impairment. Serves as repeat credit for students who completed PSY 235 prior to fall 2008. Prerequisite: 201. [3]

NSC 260. Psychopharmacology. Actions of therapeutic drugs for psychiatric disorders and of drugs of abuse. Molecular mechanisms of effects on perception, cognition, and emotion. Prerequisite: 201. [3]

NSC 269. Developmental Neuroscience. (Formerly Psychology 269). Normal and abnormal brain development. Cell division, migration, and death; synapse formation and plasticity; and clinical syndromes. Serves as repeat credit for students who completed PSY 269 prior to fall 2008. Prerequisite: 201. [3]

NSC 272. Structure and Function of the Cerebral Cortex. (Formerly Psychology 272). Classic and current concepts of cerebral function. Species differences, receptive field organization, neurotransmitters, modifications by experience, and behavioral effects. Serves as repeat credit for students who completed PSY 272 prior to fall 2008. Prerequisite: 201. [3]

NSC 274. Neuroanatomy. (Formerly Psychology 274). Gross structure, histological architecture, and techniques for creating images of the human

brain. Serves as repeat credit for students who completed PSY 201 prior to fall 2008. [3]

Neuroscience (NURO)

NURO 302. Techniques and Preparations. Laboratory rotations undertaken by Integrative Track students that culminate in the selection of a thesis adviser. FALL, SPRING. [0-6]

NURO 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 one hour with two students presenting at each session. FALL, SPRING. [0]

NURO 324. Advanced Neurophysiology. (Also listed as Molecular Physiology and Biophysics 323 and Pharmacology 323) This class is a tutorial in methods for recording electrical signals in neurons. We will begin with a crash course on ion channels and transporters, spending a significant proportion of class time on discussion of recent primary research papers. In the latter part of the semester, we will move on to live demonstrations and personal training in the details of electrophysiological recording methods in several preparations. By the end of the course, students will be prepared to perform electrophysiological experiments as part of their dissertation research. SPRING. [3] Galli.

NURO 325. Neuroscience Discussions. 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, Polley, Konradi.

NURO 327. Graduate Neuroanatomy. An intensive course on the structure and function of the brain designed specifically for neuroscience graduate students. The course is centered around a large lab portion supplemented by lectures. The course is geared towards hands-on experience and is intended to foster the ability to identify and characterize important structures and subdivisions of the rodent and primate brain using gross, histological and histochemical methods. Histological identification of specific brain structures using different types of stains, markers, and connectional methodologies will be covered. The emphasis will range from macroscopic analyses of brain structures and pathways to the cellular composition and molecular characteristics of specific brains regions, and will employ a number of modern neuroanatomical techniques. In addition, neuropathological materials will be used. The course will equip students with practical knowledge of neuroanatomy as well as modern neuroanatomical methods an approaches, which will be useful in their professional career in the neurosciences. Fall [3]

NURO 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.

NURO 331. Mammalian Developmental Neurobiology. This seminar course emphasiszes classic and cutting-edge reserach in mammalian brain development, with a particular emphasis on the forebrain. It is also intended to introduce the students to modern techniques used to examine the generation of proper brain architecture and connectivity. Prerequisite: NURO 345 SPRING [2]

NURO 332. Experimental Statistics Short Course. The goal of this course is to insure basic proficiency in statistical concepts, methods for analysis of experimental data, and enhance statistical communication skills. Core concepts to be discussed are: (1) Sources of data variation, data types that lead to different analyses (e.g. parametric vs nonparametric); (2) Variation in samples and populations, real world vs theoretical data distributions; (3) Importance and use of confidence intervals, effect size, power related to experimental design; (4) Meaning of statistical vs functional significance; and (5) Aspects of data analysis pitfalls (e.g., outliers, multiple tests, clustered data). Prerequisite: Permission of faculty. [1] Summer.

NURO 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.

NURO 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.

NURO 342. Seminar in the Neurobiology of Hearing and Multisensory Processes. (Also listed as Hearing and Speech Sciences 342) 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.

NURO 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.

NURO 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: Neuroscience 345 or Pharmacology 320, or consent of instructor. SPRING. [3] Emeson and Staff.

NURO 347. The Visual System. (Also listed as Cell and Developmental Biology 347, Psychology 336) 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 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.

NURO 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]

NURO 352. Seminar in Neuroscience. This course is linked to the Neuroscience Graduate Seminar Series, and will focus on several recent publications from the invited speaker in a "journal club" type discussion format. FALL, SPRING [1]

NURO 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 one-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.

NURO 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.

NURO 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.

NURO 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

NURO 384. The Brain and Behavior. Brain and Behavior provides a basic understanding of the human central nervous system and human behavior. The format includes lectures, lab exercises, small group discussions, and patient and case presentations. Brain and Behavior integrates three areas of medical science: (1) neuroanatomy, physiology, and biochemistry; (2) psychopathology and systems neuroscience; and (3) pathology, pharmacology, and radiology. Prerequisite: MSTP students only. SPRING. [Variable credit: 1-5] Norden, Heckers.

NURO 399. Ph.D. Dissertation Research.

Nursing Science

NRSC 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]

NRSC 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]

NRSC 304. Ethical and Legal Issues In Research. This course 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]

NRSC 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]

NRSC 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]

NRSC 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 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]

NRSC 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]

NRSC 309. Special Topics in Quantitative Methods. This course focuses on the skills needed to implement common quantitative data collection methods. The major focus of this course will be on survey methods--how to construct, administer, analyze, and interpret surveys and questionnaires, whether administered in written or verbal form (e.g., interviews), in person on via the mail or online. A portion of the course will cover the development of scales and indexes to incorporate in surveys. Sampling and observational methods to assess behavior and personal characteristics will be included. Prerequisite: completion of Research Design and Statistics I or consent of faculty. [2] Fall

NRSC 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]

NRSC 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]

NRSC 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 for basic grantsmanship. 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]

NRSC 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]

NRSC 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]

NRSC 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]

NRSC 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]

NRSC 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]

NRSC 367. Educational Evaluation for Learning in the Health Professions. This course is designed to facilitate expertise in the application of fundamental educational concepts, principles, and theories to techniques of educational measurement and evaluation. The underlying premise for the value of such knowledge is that evaluation provides evidence for sound planning and development of classroom and clinical performance evaluation tools, as well as analyzing and interpreting test results within the context of current ethical, legal, and social educational guidelines. Prerequisite: Consent of faculty. [3] Summer.

NRSC 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]

NRSC 377. Special Topics in Nursing Science. Students will discuss research and current developments of special interest to faculty and students (may be repeated for credit). Prerequisite: enrollment in the Ph.D. program or consent of faculty. [Variable credit: 1-3]

NRSC 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. Prerequisite: enrollment in the Ph.D. program or consent of faculty. [Variable credit: 0-6]

NRSC 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]

NRSC 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]

NRSC 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]

NRSC 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]

NRSC 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]

NRSC 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]

NRSC 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: 1-3]

NRSC 399. Ph.D. Dissertation Research. Prerequisite: Enrollment in the Ph.D. program and consent of faculty. [Variable credit: 0-6]

Pharmacology

PHAR-GS 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. [1-10] Barnett, Brash.

PHAR-GS 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] Iverson.

PHAR-GS 323. Advanced Neurophysiology. (Also listed as Molecular Physiology and Biophysics 323 and Neuroscience 324) This class is a tutorial in methods for recording electrical signals in neurons. We will begin with a crash course on ion channels and transporters, spending a significant proportion of class time on discussion of recent primary research papers. In the latter part of the semester, we will move on to live demonstrations and personal training in the details of electrophysiological recording methods in several preparations. By the end of the course, students will be prepared to perform electrophysiological experiments as part of their dissertation research. SPRING. [3] Galli.

PHAR-GS 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.

PHAR-GS 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.

PHAR-GS 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.

PHAR-GS 332. Experimental Statistics Short Course. The goal of this course is to insure basic proficiency in statistical concepts, methods for analysis of experimental data, and enhance statistical communication skills. Core concepts to be discussed are: (1) Sources of data variation, data types that lead to different analyses (e.g. parametric vs nonparametric); (2) Variation in samples and populations, real world vs theoretical data distributions; (3) Importance and use of confidence intervals, effect size, power related to experimental design; (4) Meaning of statistical vs functional significance; and (5) Aspects of data analysis pitfalls (e.g., outliers, multiple tests, clustered data). Prerequisite: Permission of faculty. [1] Summer.

PHAR-GS 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.

PHAR-GS 346. Advanced 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. 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: Neuroscience 345 or Pharmacology 320, or consent of instructor. SPRING. [3] Emeson and Staff.

PHAR-GS 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.

PHAR-GS 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.

PHAR-GS 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

PHAR-GS 399. Ph.D. Dissertation Research.

Philosophy

PHIL 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. [3]

PHIL 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. [3]

PHIL 210. Ancient Philosophy. An examination of the major Greek and Roman philosophers with emphasis on the works of Plato and Aristotle. [3]

PHIL 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]

PHIL 212. Modern Philosophy. An examination of the major philosophers of modern Europe from Descartes and Spinoza through Locke, Berkeley, Hume, and Kant. [3]

PHIL 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. [3]

PHIL 216. Philosophy of Knowledge. Nature, sources, and scope of scientific, moral, and religious belief. Justification, knowledge, and skeptical challenges to their legitimacy. [3]

PHIL 217. Metaphysics. Selected problems in metaphysics such as ultimate explanation, meaning of existence, time and eternity, freedom and determinism, and science and religion. [3]

PHIL 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]

PHIL 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]

PHIL 222. American Philosophy. A study of the works of selected American philosophers from the colonial period to the present. [3]

PHIL 224. Existential Philosophy. A study of two or three existential philosophers and selected problems that arise in relation to their thought. [3]

PHIL 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]

PHIL 228. Nineteenth-Century Philosophy. A study of selected themes and writings from nineteenth-century European philosophers. [3]

PHIL 231. Philosophy of History. Focus on alternative conceptions of time and history in Aristotle, Augustine, Kant, Hegel, Heidegger, and Benjamin. [3]

PHIL 232. Critical Theory. The Frankfurt School; mass culture, ideology, and modernism in the arts; the disenchantment of reason; alienation and fascism; the prospects for experience and political critique. Readings include Adorno, Horkheimer, Marcuse, Benjamin, and Habermas. [3]

PHIL 233W. Writing as Political Resistance. Writings from the political margins from authors under house arrest, in exile, or in prison. Expressions of active resistance to oppressive, and occasionally violent, political institutions. [3]

PHIL 234. Philosophy of Education. Analysis of educational concepts. Educational implications of theories of knowledge and theories of the individual. Emphasis on higher education. [3]

PHIL 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. [3]

PHIL 238. Contemporary Ethical Theory. A study of theories about the cognitive foundations of ethical discourses. Prerequisite: 105. [3]

PHIL 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. Prerequisite: 105. [3]

PHIL 239W. 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. Prerequisite: 105. [3]

PHIL 240. History of Aesthetics. History of philosophy of art, aesthetic experience, creativity, criticism, and related concepts. [3]

PHIL 241. Modernistic Aesthetics. Abstraction, nontraditional media, mixed media, new media, changes in artistic institutions, and the death of art. [3]

PHIL 242. Philosophy of Religion. A study of various problems concerning religious experiences; ideas about religion and divinity. [3]

PHIL 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]

PHIL 244. Philosophy and the Natural Sciences. Philosophical issues in the methodology, conceptual structure, patterns of explanation, historical development, and cultural impact of the natural sciences. Metaphysical and ethical implications. [3]

PHIL 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]

PHIL 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. [3]

PHIL 247. Kierkegaard and Nietzsche. A study of selected works. [3]

PHIL 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. [3]

PHIL 248W. Philosophy and Literature. Philosophical topics in novels or poetry. Examples include: meaning of life, linguistic meaning, good and evil, aesthetic value, and human freedom. [3]

PHIL 249. Philosophy of Music. Music and meaning, language, emotion, expression, interpretation, performance, the body, and politics. No musical background is required. [3]

PHIL 251. Topics in Aesthetics. Philosophy of art and aesthetic theory. [3]

PHIL 252. Political and Social Philosophy. Central issues and arguments concerning individual liberty, political authority, democracy, and justice. Key texts and arguments. Contemporary debates. [3]

PHIL 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]

PHIL 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. [3]

PHIL 256. Philosophy of Mind. Selected problems in the philosophy of mind. Relation 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. [3]

PHIL 257. Early Modern Political Philosophy. A study of competing accounts of the best form of political association, which differ from Locke, through the works of Machiavelli, Hobbes, Spinoza, and Rousseau. [3]

PHIL 258. Contemporary Political Philosophy. A focused and extended examination of selected topics in contemporary political theory, such as justice, liberty, rights, tolerance, and autonomy. Content varies depending on instructor. [3]

PHIL 260. Twentieth-Century Continental Philosophy. A study of selected twentieth-century philosophers such as Derrida, Foucault, and Lacan. [3]

PHIL 261. Jewish Philosophy. Introduction to Jewish philosophy and the philosophical achievement of such major figures as Philo, Saadiah, Maimonides, Levinas, and selected contemporary thinkers. [3]

PHIL 262. Islamic Philosophy. Introduction to the major figures of Islamic philosophy including Kindi, Razi, Farabi, Avicenna, and Ibn Khaldun. [3]

PHIL 263. French Feminism. Introduction to the tradition of French feminist philosophy, including relevant works by Beauvoir, Cixous, Irigaray, Kristeva, LeDoeuff, Kofmann, and others. [3]

PHIL 270. Ethics and Medicine. Selected ethical issues raised by clinical practice, medical theories, and biomedical research and technology. No credit for students who have completed 115F, section 3. Prerequisite: 105. [3]

PHIL 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]

PHIL 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. [3]

PHIL 272W. 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. [3]

PHIL 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. [3]

PHIL 294a. Selected Topics. Students may enroll in more than one section of this seminar each semester. [3 each seminar, maximum of 12 hours over a four-semester period in 294a and 294b combined]

PHIL 294b. Selected Topics. Students may enroll in more than one section of this seminar each semester. [3 each seminar, maximum of 12 hours over a four-semester period in 294a and 294b combined]

PHIL 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. [2]

PHIL 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. [3]

PHIL 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. [3]

PHIL 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. [3]

PHIL 305. Clinical Ethics Practicum. Introduction to and reflection on the ethos of the modern hospital. Students participate weekly in hospital rounds and reflect on their observations in seminars that incorporate selected philosophical and theological texts. Prerequisite: One graduate level course in ethics. [3]

PHIL 350. Readings in Philosophy. Selected major philosophical works or a selected bibliography about a major philosophical problem. Appropriate reports and examination. [3]

PHIL 351. History of Philosophy. Survey of figures and/or topics in history of philosophy. [3]

PHIL 352. Topics in Philosophy. Survey of topics in philosophy. [3]

PHIL 353. Figures in Philosophy. Survey of figures in the history of philosophy. [3]

PHIL 369. Master's Thesis Research. [0]

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

PHIL 399. Ph.D. Dissertation Research.

Physics

PHYS 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. Prerequisite: One year of calculus-based physics and one year of calculus. [3]

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. Prerequisite: One year of calculus-based physics and one year of calculus. [3]

PHYS 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]

PHYS 225. Introduction to Quantum Physics and Applications I. A survey of modern physics and applications based on elementary quantum mechanics: atomic and molecular structure, interaction of light with atoms and molecules, spectroscopy. One three-hour laboratory per week. Prerequisite: One year of calculus-based physics and one year of calculus. [4]

PHYS 225W. Introduction to Quantum Physics and Applications I. A survey of modern physics and applications based on elementary quantum mechanics: atomic and molecular structure, interaction of light with atoms and molecules, spectroscopy. One three-hour laboratory per week. Prerequisite: One year of calculus-based physics and one year of calculus. [4]

PHYS 226. Introduction to Quantum Physics and Applications II. A survey of modern physics and applications based on elementary quantum mechanics: condensed-matter physics, biophysics, special theory of relativity, nuclear and particle physics. One three-hour laboratory per week. Prerequisite: One year of calculus-based physics and one year of calculus. [4]

PHYS 226W. Introduction to Quantum Physics and Applications II. A survey of modern physics and applications based on elementary quantum mechanics: condensed-matter physics, biophysics, special theory of relativity, nuclear and particle physics. One three-hour laboratory per week. Prerequisite: One year of calculus-based physics and one year of calculus. [4]

PHYS 227a. Intermediate Classical Mechanics. 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, normal modes; rigid-body motion; special relativity. Prerequisite: Math 175 and one year of calculus-based physics and one year of calculus. [3]

PHYS 227b. Intermediate Classical Mechanics. Continuation of 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, normal modes; rigid-body motion; special relativity. Prerequisite: Math 175 and one year of calculus-based physics and one year of calculus. [3]

PHYS 228. Foundations of Medical Imaging. Physics and engineering of image formation for medical applications. 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: one year of calculus-based physics or MATH 196. Credit not given for both PHYS 228 and BME 258. [3]

PHYS 229a. Electricity, Magnetism, and Electrodynamics. Electrostatic fields and potentials; Gauss's law; electrical properties of insulators, semiconductors and metals; the Lorenz force; magnetic fields and forces; electro-magnetic induction, Maxwell's equations and electromagnetic waves. Prerequisite: one year of calculus-based physics and three semesters of calculus. [3]

PHYS 229b. Electricity, Magnetism, and Electrodynamics. Continuation of 229a. Electromagnetic waves in dielectrics and conductors; electromagnetic radiation in waveguide structures; relativistic electrodynamics; magnetism as a relativistic phenomenon. Prerequisite: differential equations and one year of calculus-based physics. [3]

PHYS 240. Selected Topics. Prerequisite or corequisite: 225 or 225W, and either 226 or 226W, and Math 175. [Variable credit: 1–3 each semester]

PHYS 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: Either 225 or 225W and either Math 150b or 155b. [3]

PHYS 248. Radiation Biophysics. Response of mammalian cells and systems to ionizing radiation. Acute radiation syndromes, carcinogenesis, genetic effects, and radiobiological basis of radiotherapy. Prerequisite: 224 and Biological Sciences 110a, 111a. [2]

PHYS 251a. Introductory Quantum Mechanics. Wave-particle duality, indeterminacy, superposition, the Schrödinger equation, angular momentum, the hydrogen atom, and time-independent perturbation theory. Prerequisite or corequisite: 225 or 225W, and either 226 or 226W, and Math 175. [3]

PHYS 251b. Introductory Quantum Mechanics. Spin and indistinguishability, time-dependent perturbation theory, matrix theory, scattering, applications to atomic physics, condensed matter physics, and astrophysics. Prerequisite: 229a. Prerequisite or corequisite: 225 or 225W, and either 226 or 226W, and Math 175. [3]

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: 223 and 227a. Prerequisite or corequisite: 225 or 225W, and either 226 or 226W, and Math 175. [3]

PHYS 255. Introduction to Particle Physics. Weak, strong, and electromagnetic forces as evidenced by the interactions of elementary particles. Classification of particles and experimental techniques. Prerequisite or corequisite: 225 or 225W, and either 226 or 226W, and Math 175. [3]

PHYS 257. Computational Physics. Topics in modern physics analyzed exclusively with computer programs. Three-body solar system orbits, random walk diffusion and entropy growth, magnetism in the second order using model, non-equilibrium molecular dynamics, and solutions to the Schrödinger equation with numerical methods. Prerequisites: Prerequisite: One year of calculus-based physics and one year of calculus and either CS 101, CS 103, or familiarity with commercial mathematical applications (Mathematica, Mathcad, or even EXCEL). [3]

PHYS 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, 111a–111b. [3]

PHYS 274. Principles and Applications of BioMicroElectroMechanical Systems. Principles, design, fabrication, and application of micro- and nano-devices to instrument and control biological molecules, living cells, and small organisms. Development of microfabricated systems, lab-on-a-chip, and micro-and nano-biosensors. Topical discussions from the research literature. Prerequisite or corequisite: 225 or 225W, and either 226 or 226W, and Math 175. [3]

PHYS 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. [4]

PHYS 300. Seminar. [1]

PHYS 301a. Medical Physics Seminar. Radiotherapy treatment techniques and current methodologies in clinical therapy physics. Prerequisite: 228. [1]

PHYS 301b. Medical Physics Seminar. Topics in medical imaging, techniques and applications. Prerequisite: 228. [1]

PHYS 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. [1]

PHYS 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]

PHYS 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. [3]

PHYS 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. [3]

PHYS 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 Graduate School / Physics and Astronomy 261 interact amid chaotic thermal fluctuations. Selected measurement techniques. Prerequisite: one year of calculus and one year of physics. [3]

PHYS 307. Radiation Dose Assessment. Advanced physics of radiation interactions, shielding, and dosimetry. Gamma ray and neutron shielding; internal and external dosimetry methods and models; radiation protection regulations; environmental monitoring for radioactive materials; and response to radiation accidents and emergencies. Use of specialized computer programs. Prerequisite: 243. [3]

PHYS 308. Mathematical Methods for Physicists. Linear spaces and operators; matrix algebra; differential equations; Green's function; and complex analysis. May include variational calculus; perturbation methods; group theory. [3]

PHYS 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. [3]

PHYS 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. [2]

PHYS 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. [3]

PHYS 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. [2]

PHYS 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. [2]

PHYS 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]

PHYS 329a. Advanced Electrodynamics. Electrostatics, potentials, boundary value problems, multipole moments, polarization, magnetostatics, Maxwell's equations, electromagnetic wave propagation, dissipative and conductive media. Prerequisite: 229a, 229b, and MATH 262. [3]

PHYS 329b. Advanced Electrodynamics. Continuation of 329a. Covariant formulation, least-action principle and Lagrange density, energy momentum tensor, charges in external fields, radiation from accelerated changes, multipole radiation. Prerequisite: 229a, 229b, and MATH 262. [3]

PHYS 330a. 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: 251, and MATH 262. [3]

PHYS 330b. Quantum Mechanics. Continuation of 330a. 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: 251, and MATH 262. [3]

PHYS 333a. 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]

PHYS 333b. 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]

PHYS 333c. 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]

PHYS 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]

PHYS 340a. 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]

PHYS 340b. Nuclear and Heavy-Ion Theory. Continuation of 340a. 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]

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. [3]

PHYS 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. [3]

PHYS 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. [3] Hutson. — Lie groups and symmetry principles in quantum mechanics, quantum electrodynamics of strong fields, phenomenological models of nuclear structure. Prerequisite: consent of instructor. [3]

PHYS 351a. Topics in the Physics of Elementary Particles. A single topic reflecting current faculty interest each semester. [1]

PHYS 351b. Topics in the Physics of Elementary Particles. A single topic reflecting current faculty interest each semester. [1]

PHYS 351c. Topics in the Physics of Elementary Particles. A single topic reflecting current faculty interest each semester. [1]

PHYS 351d. Topics in the Physics of Elementary Particles. A single topic reflecting current faculty interest each semester. [1]

PHYS 352a. 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. [Variable credit: 1–3]

PHYS 352b. 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. [Variable credit: 1–3]

PHYS 352c. 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. [Variable credit: 1–3]

PHYS 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. [Variable credit: 1–3]

PHYS 353. Electromagnetic Spectroscopy. Interaction of electromagnetic radiation with matter as a function of photon energy and flux.

Mechanisms of absorption, emission, and scattering of light within the visible, infrared, ultraviolet, and x-ray wavelength regimes. Experimental and computational techniques and instrumentation for assessing and analyzing spectroscopic information. Prerequisite: 330a. [3]

PHYS 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. [3]

PHYS 355. Nanoscale Condensed Matter. Evolution of elementary excitations; optical, magnetic, electronic, and mechanical characteristics of matter at nanometer length scales. Effects of one, two, and three dimensional electron confinement. Novel single-particle and collective properties of nanometer-size objects, including optical, magnetic, thermal, and transport phenomena. Prerequisite: 330a. [3]

PHYS 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]

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: 330a–330b. [3]

PHYS 360a. 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]

PHYS 360b. General Relativity and Cosmology. Continuation of 360a. 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]

PHYS 362. Interactions of Photons with Atoms, Molecules, and Solids. Quantum mechanical description of optical excitation, radiative and non-radiative relaxation, and dephasing in the two level approximation. Born-Oppenheimer approximation in molecular systems; interband and intraband transitions; and Maxwell-Bloch equations. Excitons, phonons, plasmons, and polaritons. Prerequisite: 330a or CHEM 330. [3]

PHYS 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 forces in nuclei, and superconductivity. Prerequisite: 330b. [3]

PHYS 369. Master's Thesis Research.

PHYS 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. [3]

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

PHYS 390a. Independent Study. [Variable credit: 1–3 each semester]

PHYS 390b. Independent Study. [Variable credit: 1–3 each semester]

PHYS 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]

PHYS 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]

PHYS 399. Ph.D. Dissertation Research.

PHYS 3995. Half-time Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

Political Science

PSCI 202. Ancient Political Thought. Greek and Roman political traditions. Plato, Aristotle, Cicero, and early Christian thinkers. Questions of justice, equality, democracy, and political knowledge. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 203. History of Modern Political Philosophy. Intensive analysis of the principal political philosophers in the modern tradition. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 204. American Political Thought. An analytical study of American political theories and their impact upon our political institutions. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 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. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 207. Liberalism and Its Critics. The liberal tradition in political theory and its major challengers. Critical debates surrounding the relationship between individuals and political community, rights, freedom and equality. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 207W. Liberalism and Its Critics. The liberal tradition in political theory and its major challengers. Critical debates surrounding the relationship between individuals and political community, rights, freedom and equality. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 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. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 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]

PSCI 210. West European Politics. Analysis of political development, social forces, institutions, and public policy in Great Britain, France, Germany, Italy, and Sweden. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 211. The European Union. Political and economic integration. Origins, institutions, decision processes, policies, achievements, and prospects of the European integration movement. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 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. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 215. Change in Developing Countries. Comparative study of political and economic change in developing countries. Political implications of ethnicity, economic dependency, and environmental degradation. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 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. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 217. Latin American Politics. Cross-national analysis of political institutions, cultures, and processes of change in Latin America. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 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. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 220. Crisis Diplomacy. 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. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 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. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 222. American Foreign Policy. Critical analysis of major international and domestic factors shaping U.S. foreign relations as reflected in selected twentieth-and twenty-first-century experiences. No credit for students who have taken 115F, Section 1. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 224. Theories of World Politics. Analysis of major theories of the basic factors underlying global relations. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 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. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 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, the United Nations, the International Monetary Fund (IMF), and selected regional organizations. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 227. Economics and Foreign Policy. Economic factors influencing foreign policy behavior, including economic actors, 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. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 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. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 229. Strategy and International Politics. Strategic behavior and strategic choices arising from interactive decision making within the context of international politics. General principles of strategy. In-class experiments and game playing. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 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. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 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. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 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 control. Implications for electoral outcomes, coalition formation, legislative decision making, and public policy. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 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. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 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. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 243. Political Campaigns and the Electoral Process. Theories of representation and democratic accountability; electoral strategies and tactics, including political polling and analysis. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 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. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 245. The American Presidency. Constitutional, historical, and political aspects. Attention to electing and nominating president, presidential leadership and personality, governing, and relations with Congress and the public. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 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. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 253. Ethics and Public Policy. Political and moral values in assessing policy-making, public policies and processes, and policy impacts. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 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. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 260. Introduction to American Law. Law as a component of public policy and the political system; the elements and rationale of private law. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 262. The Judicial Process. Functioning of the judiciary in the American political process; operation and powers of the courts; non-legal aspects of the judicial process; political role and effects of judicial decisions. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 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. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 265. Constitutional Law: Powers and Structures of Government. 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. Serves as repeat credit for students who completed 261a prior to fall 2009. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 266. 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. Serves as repeat credit for students who completed 261b prior to fall 2009. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 270. Conducting Political Research. Research sources, designs, and methods used by political scientists. Locating and accessing data, the logic of causal inferences, and basic data presentation and analysis. Prerequisite: Either 100, 101, 102, 103, or 150. [3]

PSCI 281. Topics in Contemporary Politics. Political, governmental, and policy issues. May be repeated for credit when topics vary. No more than three hours may be counted toward the major. Prerequisite: Either 100, 101, 102, 103, or 150. [1-3]

PSCI 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]

PSCI 301. Human Rights. Provides a historical and contemporary context for reflection on the meaning of human rights. Focus on the theory of human rights. [3]

PSCI 302. Democratic Theory. Growth of democratic theory in political philosophy and historical application. Connections between democratic theory and political institutions. [3]

PSCI 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]

PSCI 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. [3]

PSCI 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. [3]

PSCI 309. Research in Political Theory. Supervised individual research and reading on selected topics in political theory. [3]

PSCI 310. Studies in Comparative Analysis. A survey of important literature and concepts in the field of comparative politics. [3]

PSCI 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]

PSCI 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]

PSCI 314. Comparative Political Parties. Origin of political parties, party organizations and ideologies, party systems, democratic representation. [3]

PSCI 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]

PSCI 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]

PSCI 317. The Political Economy of Development. The causes of international and national inequalities in the distribution of wealth. Factors related to economic development and tied to domestic and international income distribution, such as geography, natural resources, culture, democracy, and dependency. Examples from throughout the world, especially Asia and Latin America. [3]

PSCI 319. Research in Comparative Analysis. Supervised individual research and reading on selected topics in comparative politics. [3]

PSCI 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. [3]

PSCI 321. International Conflict: Theories and Methods. Analysis of international conflict and war. [3]

PSCI 323. Current Theory and Research in World Politics. Recent trends in theory construction, research design, and findings. [3]

PSCI 328. Ideas and International Security. Role of collectively-held meanings and shared ideas (identity, norms, beliefs, values) in national security and political behavior. Texts from political science, economics, philosophy, military strategy and history, and sociology. Real world applications include perceptions of war and war outcomes, security strategy formulation, and impact of identity on international relations. [3]

PSCI 329. Research in International Politics. Supervised individual research and reading on selected topics in international politics. [3]

PSCI 330. Studies in American Politics. A survey of important literature and concepts in the field of American politics. [3]

PSCI 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]

PSCI 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]

PSCI 334. Political Psychology. The psychological roots of individual choice and judgment in politics. Cognitive and affective theories of political decision-making. Survey responses, political identity, and explicit or implicit attitudes. [3]

PSCI 335. Politics of American Legislation. The structure and function of American legislative institutions, especially Congress, and their relation to the wider setting. [3]

PSCI 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; policymaking by the courts. [3]

PSCI 339. Research in American Politics. Supervised individual research and reading on selected topics in American politics. [3]

PSCI 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. [3]

PSCI 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. [3]

PSCI 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. [3]

PSCI 358. Topics in Political Methodology. May be repeated for credit when topics vary. [3]

PSCI 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]

PSCI 360. Topics in Formal Theory and Modeling. May be repeated for credit when topics vary. [3]

PSCI 361. Writing Proposals and Securing Grants in the Empirical Social Sciences. [3]

PSCI 369. Master's Thesis Research. [0]

PSCI 370. Topics in Political Science. An inquiry into selected topics. May be repeated for credit when topics vary. [3]

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

PSCI 390a. Independent Study. [Variable credit: 1–3 each semester]

PSCI 390b. Independent Study. [Variable credit: 1–3 each semester]

PSCI 399. Ph.D. Dissertation Research.

PSCI 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

PORT 200. Intermediate Portuguese. Review of Portuguese grammar with emphasis on conversation, composition, and reading of modern Portuguese literary texts. Prerequisite: 102 or equivalent. [3]

PORT 201. Portuguese Composition. Techniques of expository writing. Focus on vocabulary, grammar, and rhetoric. Prerequisite: 200. [3]

PORT 202. Portuguese Conversation. Development of speaking skills with emphasis on pronunciation, grammar, and vocabulary. Prerequisite: 200. [3]

PORT 203. Brazilian Pop Culture. Development of written and oral communication skills through the study of Brazilian popular culture. Movies, music, television, and magazines. Prerequisite: 200. [3]

PORT 205. Introduction to Luso-Brazilian Literature. Critical readings and methods of literary analysis. Masterpieces from Portugal and Brazil from all genres in several periods. Conversation and writing. Prerequisite: 201 or 203. [3]

PORT 225. Brazilian Culture through Native Material. Differences between spoken and written Portuguese in Brazil. Modern Brazilian culture, including popular music, film, politics, family life, and sports. Prerequisite: 200, 201, 202, or 203. [3]

PORT 232. Brazilian Literature through the Nineteenth Century. 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. Prerequisite: 205. [3]

PORT 233. Modern Brazilian Literature. Brazilian literature from the Semana de Arte Moderna to the present. Modernist and neo-Modernist movements. Prerequisite: 205. [3]

PORT 289. Independent Study. A reading course, the content of which varies according to the needs of the individual student. Primarily designed to cover pertinent material not otherwise available to the student in the regular courses of the curriculum. [Variable credit: 1–3 hours, not to exceed 12 over a four-semester period]

PORT 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. [3]

PORT 294. Special Topics in Portuguese Language, Literature, or Civilization. [3]

PORT 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. [3]

PORT 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. [3]

PORT 310. Foreign Language Learning and Teaching. (Also listed as Spanish 310.) Designed for departmental teaching assistants. Introduction to language teaching methodologies and assessment. Focus on practical applications. [1]

PORT 314. Introduction to Latin American Colonial Studies. (Also listed as Spanish 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]

PORT 338. Seminar: Studies in Colonial Literature. (Also listed as Spanish 338) [3]

PORT 340. Seminar: Hispanic American Essay. (Also listed as Spanish 340) [3]

PORT 341. Spanish American and Brazilian Literature I. (Also listed as Spanish 341) Literature in a comparative perspective: from the conquests to the end of the nineteenth century. Authors may include Sor Juana, Matos, Alencar, Assis, and Carrasquilla. [3]

PORT 342. Spanish American and Brazilian Literature II. Literature in a comparative perspective: twentieth century to the present. Texts may include: Os Sertões, La Guerra del Fin del Mundo, Ficciones, Perto do Coração Selvagem, and Água Viva. [3]

PORT 351. Comparative Methodology. (Also listed as Spanish 351) Comparative methodology of the literatures of the Spanish and Portuguese speaking world; emphasis on issues of theme, genre, period and movement, translation, and the relationship of literary scholarship to other humanistic endeavors, such as music, film, philosophy, painting, and the plastic arts. [3]

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

PORT 385. Seminar: Studies in Contemporary Literature of the Portuguese-Speaking World (Portugal, Brazil, Lusophone Africa). Variable topics to be announced. May be repeated with change of topic. [3]

PORT 398. Special Studies in Brazilian Literature. [Variable credit: 1–6]

PORT 399. Ph.D. Dissertation Research.

PORT 3995. Half-time Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

Psychology (Arts and Science)

PSY 216. Movement. Psychological, computational, and neural perspectives on the activities of looking, reaching, grasping, speaking, smiling or frowning, walking and running. Prerequisite: 101. [3]

PSY 238. Social Cognition and Neuroscience. Neural underpinnings of social perceptions, evaluations, and decisions. Face perception, attraction and reward processing, social co-operation and competition, decision-making, and moral judgments. Prerequisite: 101. [3]

PSY 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. Prerequisite: 101. [3]

PSY 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. Prerequisite: 101. [3]

PSY 280. Special Topics in Perception. Prerequisite: 101. [3]

PSY 282. Special Topics in Cognitive Psychology. Prerequisite: 101. [3]

PSY 285. Special Topics in Neuroscience. Prerequisite: 101. [3]

PSY 288. Special Topics in Clinical Psychology. Prerequisite: 101. [3]

PSY 289. Special Topics in Social Psychology. Prerequisite: 101. [3]

PSY 300a. Research Seminar. [Variable credit: 1–4]

PSY 301a. 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]

PSY 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. [3–3]

PSY 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]

PSY 306. Evolutionary Psychology. Interdisciplinary analysis of the origins of mind, with particular emphasis on the mind/brain as a product of biological evolution. [3]

PSY 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]

PSY 312. Psychological Assessment. Major techniques of psychological assessment, with an emphasis on the rationale, administration, and interpretation of measures assessing personality and psychopathology. [3]

PSY 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. [3]

PSY 316. Brain Imaging Methods. Principles and methods used in human neuroimaging, with emphasis on functional magnetic resonance imaging (fMRI). [3]

PSY 318. Computational Modeling. Developing and testing computational models of human cognition and brain function. How to implement models, recognize good modeling, fit models to data, evaluate models, contrast competing models, develop and test new models. Discussion of Monte Carlo simulations, statistical numeric methods, and high-performance computing. [3]

PSY 320. Categorical Data Analysis. Analysis of categorical data. Statistical analysis of binary, nominal, 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: 304b, 310, or equivalents. [3]

PSY 323. Practicum in Psychological Assessment. [Variable credit: 1–5 each semester]

PSY 324. Practicum in Psychotherapy. [Variable credit: 1–5 each semester]

PSY 325. Advanced Standing in Psychological Assessment. [Variable credit: 1–5 each semester]

PSY 326. Advanced Standing in Psychotherapy. [Variable credit: 1–5 each semester]

PSY 331a. Advanced Investigational Techniques. A non-thesis research project. [1-6]

PSY 331b. Advanced Investigational Techniques. A non-thesis research project. [1-6]

PSY 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]

PSY 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. [3]

PSY 342. Seminar: Social. [3]

PSY 343. Seminar: Perception. [3]

PSY 344. Seminar: Neuroscience. [3]

PSY 351. Seminar: Cognitive Psychology. [3]

PSY 352. Seminar: Clinical Psychology. [3]

PSY 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. [3]

PSY 354. Clinical Neuropsychology. Cognitive and behavioral disorders associated with brain injury and disease. Methods of neuropsychological assessment. Prerequisite: 343P or permission of instructor. [3]

PSY 355. Diversity and Differentness. Theory, issues, and practical application of cultural sensitivity and competency in research and clinical settings. Not available on a P/F basis. [1-3]

PSY 357. Seminar in Cognitive Science. Integration of the subareas of cognitive science. [Variable credit: 1–2 hours each semester] May be repeated up to four times.

PSY 358. Seminar in Neuroscience. Integration of the subareas of neuroscience. [Variable credit: 1–2 hours each semester] May be repeated up to four times.

PSY 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. [Variable credit: 1–2 hours per semester] May be repeated up to four times.

PSY 369. Master's Thesis Research.

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

PSY 398. Internship. [0]

PSY 399. Ph.D. Dissertation Research.

Psychology and Human Development (Peabody)

PSY-GS 301. 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]

PSY-GS 303. 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)

PSY-GS 304. 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]

PSY-GS 305. 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]

PSY-GS 309. 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]

PSY-GS 310. 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]

PSY-GS 311. 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]

PSY-GS 312. Multivariate Statistics. Psychological measurement theory, along with correlational and regression analysis techniques essential to the development of that theory. Prerequisite: 310P or equivalent. [3]

PSY-GS 313. 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]

PSY-GS 314. 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]

PSY-GS 315. 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]

PSY-GS 317. 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]

PSY-GS 318. 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]

PSY-GS 319. 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]

PSY-GS 325. Proseminar in Mental Retardation. (Also listed as Special Education 3250) Variable topics. May be repeated with change in topic. [2]

PSY-GS 334. 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]

PSY-GS 336. 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]

PSY-GS 338. Family Therapy. Techniques of family and marital therapy, integrating cognitive-behavioral, systemic, and structural approaches. [3]

PSY-GS 339. Advanced Seminar in Educational Psychology. May be repeated with change of topic. [Variable credit: 1-3]

PSY-GS 340. Psychopathology. The major forms of psychopathology: child, adolescent, and adult. Recent research, classification systems, and developmental variables affecting psychopathology. [3]

PSY-GS 343. 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]

PSY-GS 344. Psychological Intervention: Individual Focus. Theories and research in psychotherapy. Some initial skill training will be provided. Required before taking practica. Prerequisite: 343 [Variable credit: 1-3]

PSY-GS 345. Seminar in Systems and Community Psychology. Systems and social ecology theory, and community applications of systems psychology. [3]

PSY-GS 347. Advanced Seminar in Community Psychology. May be repeated with change of topic. [Variable credit: 1-3]

PSY-GS 349. Advanced Seminar in Clinical Psychology. May be repeated with change of topic. [3]

PSY-GS 350. Human Learning. Overview of the major experimental approaches to human learning, with an emphasis on the limitations/contributions of each paradigm. [3]

PSY-GS 352. Human Cognition. Current research and theory in cognitive psychology. Emphasis on memory, perception, and language. Some applications of cognitive theories are explored. [3]

PSY-GS 354. 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]

PSY-GS 355. 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]

PSY-GS 357. Seminar in Behavioral Biology. Selected topics in behavioral biology-e.g., ethology. Content varies according to student needs and interests. May be repeated. [3]

PSY-GS 360. Developmental Psychology. Central issues, theories, and methods. [3]

PSY-GS 361. 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 360 [3]

PSY-GS 363. 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]

PSY-GS 368. Advanced Seminar in Developmental Psychology. May be repeated with a change of topic. [3]

PSY-GS 369. 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]

PSY-GS 370. Theories of Personality. Psychoanalytic theories, phenomenological theories, and behavioral theories. The process of theory development and the interaction of theory and empirical confirmation. [3]

PSY-GS 375. Social Psychology. Emphasis on current theory and research. [3]

PSY-GS 378. 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]

PSY-GS 379. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

PSY-GS 380. 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]

PSY-GS 381. 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]

PSY-GS 382. 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]

PSY-GS 384. 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]

PSY-GS 386. 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]

PSY-GS 389. Seminar on Psychological Issues and Ethics. Emerging professional and ethical issues confronting psychologists engaged in research or practice. [1]

PSY-GS 390. 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]

PSY-GS 392. 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]

PSY-GS 393. Advanced Seminar in Personality and Social Psychology. May be repeated with change of topic. [Variable credit 1-4]

PSY-GS 396. Special Topics in Psychology. May be repeated with change of topic. [Variable credit: 1-4]

PSY-GS 397. 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]

PSY-GS 399. Ph.D. Dissertation Research.

PSY-GS 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

REL 2001. Theology and Practice Colloquy. The colloquy provides a social space for deliberation about the goods of theological education. Driven by student presentations, the colloquy considers especially questions of vocation, teaching, and research. Enrollment is limited to fellows in the Program in Theology and Practice. Fellows are required to enroll in the colloquy in each semester of their first three years of doctoral study. Pass/Fail. [1, awarded at the end of each full year]

REL 2002. Theology and Practice Core Seminar. Various topics. [3] Staff.

REL 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.

REL 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.

REL 2500. Elementary Biblical Hebrew I. 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. [3] Staff.

REL 2501. Elementary Biblical Hebrew II. This is the second 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. [3] Staff.

REL 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.

REL 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]

REL 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.

REL 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.

REL 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.

REL 2514. Elementary Modern Hebrew I. Introduction to alphabet, the basics of grammar, and elementary conversation. [3] Staff.

REL 2515. Elementary Modern Hebrew II. Emphasis on conversation and grammar. [3] Staff.

REL 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.

REL 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]

REL 2564. Martin Luther King, Jr. 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.

REL 2566. Songwriting from a Theological Perspective. This is a studio class where students concentrate on the production of songs in a theologically reflective environment. The course aims to meet the needs of students who come to VDS each year with an interest in communicating and educating through music.

REL 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.

REL 2600. Beginning Koiné Greek I. This is the first course in a two-semester sequence of study leading to a knowledge of the New Testament. [3] Staff.

REL 2601. Beginning Koiné Greek II. This is the second course in a two-semester sequence of study leading to a knowledge of the New Testament. [3] Staff.

REL 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.

REL 2656. Constructive Christian Theology I. In this introduction to the discipline of theology, students will gain practice in the reading of important texts in the field, formulating critical positions, and enhancing theological inquiry and writing skills. The 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 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, Creation and the relation of God to the world, soteriology, and Christology. [3] Staff.

REL 2657. Constructive Christian Theology II. In this introduction to the discipline of theology, students will gain practice in the reading of important texts in the field, formulating critical positions, and enhancing theological inquiry and writing skills. The 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 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, Creation and the relation of God to the world, soteriology, and Christology. [3] Staff.

REL 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.

REL 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]

REL 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]

REL 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.

REL 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.

REL 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.

REL 2714. Gods, Rulers, and Saints: Portraits in Roman and Christian Art.

REL 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.

REL 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.

REL 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]

REL 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]

REL 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 Unites 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.

REL 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.

REL 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]

REL 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.

REL 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.

REL 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.

REL 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.

REL 3005. Popular Music and Religious Identity. What religious themes are prevalent in popular music today? How does popular music shape religious identity? How does faith shape popular music? What religious and spiritual experiences shape how music is heard, performed, consumed, or otherwise experienced? How is the music industry shaped by, and a shaper of, religious truth and identity today? These are among the questions this course will seek to address. [3] J. McClure.

REL 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.

REL 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] J. McClure.

REL 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]

REL 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]

REL 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]

REL 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.

REL 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. [3]

REL 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.

REL 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.

REL 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.

REL 3052. Self and 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.

REL 3053. 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.

REL 3054. 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.

REL 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.

REL 3056. 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]

REL 3057. Theology and Personality. This seminar from the pastoral theology and counseling discipline explores variable topics.

REL 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]

REL 3059. 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.

REL 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.

REL 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.

REL 3064. 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.

REL 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.

REL 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.

REL 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.

REL 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.

REL 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.

REL 3073. 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.

REL 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.

REL 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.

REL 3081. Christian 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.

REL 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.

REL 3102. Intermediate Modern Hebrew I. Modern Hebrew reading, conversation, and advanced grammar. Spring: greater emphasis on reading and writing. Prerequisite: one year of Modern Hebrew or its equivalent. [3] Staff.

REL 3103. Intermediate Modern Hebrew II. Modern Hebrew reading, conversation, and advanced grammar. Spring: greater emphasis on reading and writing. Prerequisite: one year of Modern Hebrew or its equivalent. [3] Staff.

REL 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]

REL 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.

REL 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.

REL 3112. Apocalyptic. A study of the early Jewish and Christian apocalyptic movements and literature. [3] Knight, Levine.

REL 3113. The 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. Attention to the structure of wisdom thought, to literary forms, and to traditions. [3] Azzoni.

REL 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]

REL 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.

REL 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.

REL 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.

REL 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]

REL 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]

REL 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.

REL 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.

REL 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.

REL 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.

REL 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.

REL 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]

REL 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.

REL 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.

REL 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.

REL 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.

REL 3139. 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.

REL 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]

REL 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.

REL 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.

REL 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.

REL 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.

REL 3154. Gospel According to Luke. Exploration of Luke's compositional techniques, possible sources, Christology, community formation, and ethics, utilizing a variety of approaches (sociohistorical, literary, ideological, feminist). Knowledge of Greek required. [3] Levine.

REL 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.

REL 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.

REL 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.

REL 3162. The Pauline Interpretation of Christianity. Pauline Christianity and its place in the early church, using the letters of Paul, the deutero-Pauline letters, and the portrait of Paul in Acts. Attention to the problems of method. Greek not required. [3] Patte.

REL 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.

REL 3164. The Johannine Literature. Exegesis of selected passages of the fourth gospel, with emphasis on the major Johannine themes and symbology. [3] Segovia.

REL 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.

REL 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.

REL 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.

REL 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.

REL 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 be 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.

REL 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.

REL 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.

REL 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.

REL 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.

REL 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.

REL 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.

REL 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]

REL 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]

REL 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.

REL 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.

REL 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.

REL 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]

REL 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.

REL 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]

REL 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]

REL 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.

REL 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.

REL 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.

REL 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.

REL 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.

REL 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.

REL 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.

REL 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.

REL 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.

REL 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.

REL 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]

REL 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.

REL 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.

REL 3229. Seminar in Wesleyan Theology. The development of Wesley's doctrines of God, grace, and sanctification and their contribution to ecumenical theology. [3] Meeks.

REL 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.

REL 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]

REL 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.

REL 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.

REL 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.

REL 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.

REL 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.

REL 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.

REL 3249. 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.

REL 3250. History of Anti-Trinitarian Theology.

REL 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.

REL 3254. 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.

REL 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.

REL 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.

REL 3271. Worship in the Reformed Tradition. Sources and contemporary development of liturgical theology in the Reformed tradition. [1]

REL 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 of 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'Reilley, The Barn at the End of the World: The Apprenticeship of a Quaker, Buddhist Shepherd. [3] D. Sasson.

REL 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]

REL 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]

REL 3311. Modern Critics of Religion. This seminar examines the relationship between the critique of religion and the understanding of modernity under the aegis of Marx's famous apothegm: "the criticism of religion is the prerequisite of all criticism." To that end, it first traces the genealogy of Marx's remark in the Hegelian tradition's tie of religion and society as well as explores the notion of critique. Then after analysis of Marx's own work, in particular his appropriation of religious discourse to undertake social criticism, the seminar considers critiques of religion that appear to belie the optimistic assessment that preceded Marx's dictum: "For Germany, the criticism of religion has been essentially completed." The work of the two leading critics of modernity who follow Marx-Freud and Nietzsche-are addressed. [3] Geller.

REL 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 postmodern. 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 John Rawls, Kent Greenawalt, Donald Moon, William Connolly, Derrida, A. MacIntyre, John Yoder, John Milbank, and S. Welch, among others. [3]

REL 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.

REL 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.

REL 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.

REL 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.

REL 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.

REL 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.

REL 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]

REL 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]

REL 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.

REL 3325. Protestant Theology in The Nineteenth Century. Major movements in Protestant thought during the nineteenth century, from Schleiermacher to Troeltsch. [3] DeHart.

REL 3327. Contemporary Theology. The major movements in Christian thought from the beginnings of dialectical theology to the present. [3] Meeks.

REL 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.

REL 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 Levinias, Luce Irigary, and Julia Kristeva. [3] Armour.

REL 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.

REL 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.

REL 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.

REL 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]

REL 3345. Latin American Biblical Criticism.

REL 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.

REL 3347. Acts of the Apostles. Exegesis of selected passages from Acts 1-15 with foci on various methodological perspectives. Greek required. [3] Levine.

REL 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.

REL 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.

REL 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]

REL 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.

REL 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.

REL 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.

REL 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]

REL 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 Jaggar. [3] G. Welch.

REL 3403. American Pragmatism & Empirical Theology. 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.

REL 3410. Political Ethics: The Tradition of Political Liberalism. An examination of the political thought of prominent thinkers. [3] Anderson.

REL 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.

REL 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.

REL 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]

REL 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, The Chrisian Ethics of Sex, and Contemporary Social Problems (racism, violence, education, etc.). [3]

REL 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 theoethical 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.

REL 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.

REL 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 (Troltsch, 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.

REL 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.

REL 3426. Theories of Practice. This course will meet the requirement for Seminar II for doctoral students in Homiletics and Liturgics. [3] Smith.

REL 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]

REL 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]

REL 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.

REL 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.

REL 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.

REL 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]

REL 3502. Judaism and Modernity. This course undertakes a historical and cultural analysis of the dilemmas Jewish Emancipation presented to both Jews and non-Jews in Europe, pre-eminently in Central Europe. By examining representations of Jews in a variety of popular and elite, political and philosophic, scientific and literary texts (including films) this course traces how antisemitism became entangled in the problems of gender, sexual, racial (ethnic), class, and self identity. The course has two goals. First, it seeks to explore the pervasiveness of antisemitic discourse in nineteenth- and twentieth-century European culture. Second it analyzes the implications upon Jewish identity of the double bind of modern Jewish existence before the Shoah: The European society into which many Jews sought admission demanded complete assimilation of the dominant culture, even to the point of obliterating any traces of Jewishness or Judaism; yet, often accompanying the demand was the assumption that Jews were constitutionally incapable of eliminating their difference. To fulfill these goals this course undertakes a series of close readings of primary texts supplemented by contextual histories. [3] Geller.

REL 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]

REL 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]

REL 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.

REL 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]

REL 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]

REL 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'a, al-Hallaj, Rumi, al-Ghazali, and others. No prior knowledge of Islam is required. [3] McGregor.

REL 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.

REL 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.

REL 3524. The Holocaust: Its Meanings and Implications. This course examines the systematic destruction of European Jewry and other groups during World War II, its background, and its aftermath. It addresses the attempts by victims, bystanders, perpetrators, and their descendants—and we are all their descendants—to create meaningful narratives about an event that appears to lack discernible meaning. To that end it focuses upon historical accounts, case studies, memoirs, fiction, and theology and such issues as history, memory, witness, conscience, language, evil, and otherness that they raise. Particular emphasis is upon the many roles of film in both the Third Reich and the postwar world. National Socialism employed films to mobilize support for its rule and to inculcate its racial-eugenic worldview. In the wake of the Holocaust, film has been employed for other purposes: to document, to bear witness, to mitigate or reduce its import, to provide meaning, to unmask attempts to mystify or suppress the past, to explore relationships between those events and contemporary societies, to say the unsayable, to examine the life of the traumatized victim. No prior study is presupposed of these events that have come to be known as the Holocaust. [3] Geller.

REL 3525. History of the Study of Religion. This course is devoted to the examination of the historical constructions and deployments of one of the fundamental signifiers that constitute the academic study of religion. Previous course foci have included: fetishism, gift exchange, sacrifice, secrecy. [3] Geller.

REL 3530. Religion and Film.

REL 3531. Religious Narrative and the Self. This course addresses a number of issues raised by autobiographical narrative in general, and by religious autobiography in particular. These include motivations (personal salvation, testimony or witness, therapy, to mobilize believers, to proselytize); relationships among self, family, God, and religious tradition; relationships among life, death, and afterlife; life before and after conversion; role of memory and narrative; multiple selves (remembered, remembering, writing, and presupposed, as well as the recovered or false); mind and body; oral vs. written; fact vs. truth; privacy vs. publicity; Ego vs. Self vs. non-Self; cultural, ethnic, gender, sexual, and religious differences; genre (confession, diary, memoir, novel, biography); as well as fundamental questions about the nature of autobiography: is it the narrative of how a self endeavors to know itself or, as understood from one contemporary critical perspective, by which a self constructs its own identity or, as understood by another contemporary perspective, how a narrative generates a fictitious self? In addition to the classic exemplars of the genre like Augustine and Rousseau, emphasis will be placed on the autobiographies of those for whom the dominant society has denied a self (in particular, African American and Jewish European,) as well as on the demands that an event like the Holocaust makes on the autobiographical and religious consciousness of those who have as it were survived their own deaths. [3] Geller.

REL 3534. Freud and Jewish Identity. This course examines selected writings of Sigmund Freud within the context of contemporary Viennese Jewish life and antisemitic discourses. Through an analysis of Freud's rhetoric—figures, topoi, exemplar, emphases, omissions, anomalies—it explores how psychoanalytic theory developed in response to the traumas of Jewish assimilation and of antisemitic repudiation-whether by acting them out or working through them. In particular it examines the intersections of notions of gender, sexuality, and race/ethnicity in Freud's work where those responses especially emerge. Freud's psychoanalytic writings will be supple-

mented by his letters as well as by material on the social and cultural history of his times. [3] Geller.

REL 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.

REL 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.

REL 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.

REL 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]

REL 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. [0] Staff.

REL 3690. Master's Thesis Research. [0]

REL 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.

REL 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.

REL 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.

REL 3757. Methods in Theology and the Social Sciences. 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.

REL 3760. Clinical Seminar. An ongoing case conference required of all Ph.D. students in Religion and Personality. [0-3] Miller-McLemore, Staff.

REL 3790. Non-Candidate Research. Research prior to entry into candidacy (completion of Qualifying Examination) and for special non-degree students. [Variable credit: 0-12]

REL 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]

REL 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.

REL 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]

REL 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.

REL 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]

REL 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]

REL 3808. Marriage in the Ancient Near East and the Hebrew Bible. Religious, legal, and socio-economic aspects of marriage. Survey of ancient Sumerian, Assyrian, Babylonian, and Egyptian sources, and relevant sections of the Hebrew Bible. Marriage as an institution at the beginning of recorded history. FALL. [3] Azzoni.

REL 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.

REL 3810. West Semitic Inscriptions. Readings in selected Phoenician, Aramaic, and Punic texts, with relevant grammatical analysis. Knowledge of Hebrew required. [3] J. Sasson.

REL 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.

REL 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.

REL 3814. Intermediate Biblical 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]

REL 3815. Ugaritic. Elements of Ugaritic grammar, with reading in selected texts. Prerequisite: Elementary Biblical Hebrew. [3] Azzoni.

REL 3816. Advanced Biblical Hebrew. Reading of selections from the Hebrew Bible, with emphasis on syntax and text criticism. Prerequisite: Elementary Biblical Hebrew. [3] Knight.

REL 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.

REL 3821. Syriac. Vocabulary, forms, and syntax of classical Syriac, with readings from the Peshitta, Ephraem Syrus, etc. [3] (Not currently offered)

REL 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 (Thutmoses 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.

REL 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.

REL 3826. Advanced New Testament Greek. Knowledge of Greek required. [3]

REL 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]

REL 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.

REL 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.

REL 3830. New Testament Studies: Ethos and Locos/Methods and Theories. Open to GDR students only. [3] Segovia.

REL 3831. Akkadian I. Elements of Akkadian (Assyro-Babylonian) grammar, with reading in selected texts. Consent of the instructor required. [3] J. Sasson.

REL 3832. Akkadian II. Reading in selected historical, mythical, legal, and epistolary texts. Consent of the instructor required. [3] J. Sasson.

REL 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.

REL 3836. 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.

REL 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.

REL 3841. Seminar in New Testament. [Variable credit]

REL 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]

REL 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.

REL 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.

REL 3853. Graduate Seminar in Church History. Themes, issues, and approaches that have received attention in recent historical scholarship. [3]

REL 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.

REL 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.

REL 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.

REL 3880. Daoist/Taoist Traditions.

REL 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]

REL 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.

REL 3883. Ancient Goddesses. Ancient concepts of the feminine divine in literature and iconographic evidence. Specific goddesses, their spheres of influence, and their place in the various pantheons. Cultic practices and religious syncretism across cultures, including Mesopotamia, Egypt, and Ancient Israel. [3] Azzoni.

REL 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.

REL 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.

REL 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.

REL 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.

REL 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.

REL 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.

REL 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.

REL 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]

REL 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]

REL 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.

REL 3957. Seminar in Advanced Theological Ethics.

REL 3960. Liberation Ethics.

REL 3961. Special Topics in Religion. [3]

REL 3970. Reading Course in Religion, Psychology, and Culture. May be repeated. [1-3] Staff.

REL 3971. Reading Course in Pastoral Theology. May be repeated. [1-3] Staff.

REL 3972. Reading Course in Homiletics. May be repeated. [1-3] Staff.

REL 3973. Reading Course in Liturgics. May be repeated. [1-3] Staff.

REL 3974. Reading Course in Hebrew Bible. May be repeated. [1-3] Staff.

REL 3975. Reading Course in New Testament. May be repeated. [1-3] Staff.

REL 3976. Reading Course in Ethics. May be repeated. [1-3] Staff.

REL 3977. Reading Course in Medical Ethics. May be repeated. [1-3] Staff.

REL 3978. Reading Course in European Church History. May be repeated. [1-3] Staff.

REL 3979. Reading Course in American Church History. May be repeated. [1-3] Staff.

REL 3980. Reading Course in Early Church History. May be repeated. [1-3] Staff.

REL 3981. Reading Course in Historical Theology. [1-3] Staff.

REL 3982. Reading Course in Judaism. May be repeated. [1-3] Staff.

REL 3983. Reading Course in Systematic Theology. May be repeated. [1-3] Staff.

REL 3984. Reading Course in Philosophical Theology. May be repeated. [1-3] Staff.

REL 3985. Reading Course in History and Critical Theories of Religion. May be repeated. [1-3] Staff.

REL 3987. Readings in Religion/Gender/Sexuality. May be repeated. [1-3] Staff.

REL 3988. Reading Course in Modern European Church History. May be repeated. [1-3] Staff.

REL 3990. Ph.D. Dissertation Research. May be repeated. [0-12] Staff.

REL 3991. Reading Course in Reformation History. [1-3] Staff.

REL 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.

Russian

RUSS 221. Survey of Russian Literature in English Translation. Main currents, writers, and works of Russian literature. The nineteenth century: Pushkin, Lermontov, Gogol, Turgenev, Dostoevsky, and Tolstoy. [3]

RUSS 222. Survey of Russian Literature in English Translation. Main currents, writers, and works of Russian literature. The twentieth century: Bulgakov, Pasternak, Solzhenitsyn, Aksenov, Trifonov, and Petrushevskaya. No knowledge of Russian required. [3]

RUSS 223. Composition and Conversation. Development of all language skills at the intermediate-advanced level. Reading of contemporary short stories. Prerequisite: 204. [3]

RUSS 224. Composition and Conversation. Continuation of 223. Development of all language skills at the intermediate-advanced level. Reading of contemporary short stories. Prerequisite: 204. [3]

RUSS 231. Jews in Russian Culture: Survival and Identity. A course on the history of Jewish contributions to Russian culture, including literature, the visual arts, theatre, and film. Questions of assimilation, the rise of Jewish national consciousness, and interest in Jewish heritage are discussed. No knowledge of Russian required. [3]

RUSS 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. [3]

RUSS 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]

RUSS 234. The Russian Cinema. Socialist Realism of the 1930s to 1950s; masterpieces of the post-Stalin era in the1960s 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. [3]

RUSS 257. Advanced Composition and Conversation. Prerequisite: 224. [3]

RUSS 258. Advanced Composition and Conversation. Continuation of 257. Prerequisite: 224. [3]

RUSS 289a. 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, maximum of 6 hours over a four-semester period in 289a and 289b combined]

RUSS 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, maximum of 6 hours over a four-semester period in 289a and 289b combined]

Sociology

SOC 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]

SOC 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]

SOC 224. Women and the 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. [3]

SOC 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]

SOC 231. Criminology. The nature, distribution, causes, and control of crime with emphases on contemporary American society and a broad range of types of crime. [3]

SOC 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. [3]

SOC 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. [3]

SOC 234. Prison Life. Prison life from the perspective of prisoners, officials, and the society in which they operate. [3]

SOC 235. Contemporary American Society. Shifts in the political, economic, and social structure of the United States; changes in technology, demography, and social mores. [3]

SOC 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. [3]

SOC 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]

SOC 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]

SOC 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]

SOC 244. Politics, State, and Society. The relationship between state and society; the nature and distribution of power in democratic society; the social conditions necessary for democracy; social movements and protest in political change; and the politics of public policy making. Attention to political actions, definitions of citizenship, and political ideology. [3]

SOC 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]

SOC 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. [3]

SOC 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]

SOC 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. [3]

SOC 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. [3]

SOC 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]

SOC 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]

SOC 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]

SOC 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. [3]

SOC 263. Religion, Science, and the Paranormal. Critical study of paranormalism as a belief system at the fringes of science and religion. [3]

SOC 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. [3]

SOC 270. Human Ecology and Society. Demography, social organization, technology, and the global environment. Shifting energy systems; sustainable industries; food production. Growth vs. development. Affluence, waste, and recycling. [3]

SOC 294. Seminars in Selected Topics. May be repeated for credit once if there is no duplication of topic. [3]

SOC 301. Classical Theory. Theoretical perspectives and theorists in the early history of sociology, focusing primarily on Durkheim, Marx, and Weber. [3]

SOC 302. Contemporary Theory. Modern developments including neo-Marxist, functionalist, structuralist, conflict, interactionist, exchange/rational choice, and feminist theories. [3]

SOC 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. [3]

SOC 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. [3]

SOC 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. [3]

SOC 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]

SOC 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. [3]

SOC 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. [3]

SOC 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]

SOC 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]

SOC 337. Race and Racism. Survey seminar on race and racism. Social scientific literature addressing the meaning of race and racism, with particular emphasis on relations among blacks, whites, Asians, and Hispanics in the United States. [3]

SOC 338. Biopolitics and Biopower. The role of medicine and science in human lives with emphasis on the ideas of Michel Foucault and medical sociologists. How society and culture are reshaped by contemporary biomedical practices and their globalization. Consequences for health and illness, bodies, ways of living and dying. [3]

SOC 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]

SOC 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]

SOC 343. Survey Seminar on Social Psychology. The interaction of social structure and personality. Socialization, social perception, small groups, exchange theory, and symbolic interactionism. [3]

SOC 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]

SOC 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]

SOC 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. [3]

SOC 362. 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]

SOC 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]

SOC 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]

SOC 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. [3]

SOC 369. Master's Thesis Research. [0]

SOC 371. Special-Topic Seminars on Methodology. Each seminar focuses on a particular kind of research method or statistical technique. [3]

SOC 372. Special-Topic Seminars on Theory. Each seminar focuses on a particular theorist, a particular theoretical perspective, or the methodology of theory construction. [3]

SOC 373. Workshop on Sociological Criticism. Intensive introduction to peer review for publication, using materials from journal submissions to editorial correspondence. [3]

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

SOC 390a. 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. [Variable credit: 1–3 each semester]

SOC 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. [Variable credit: 1–3 each semester]

SOC 395a. Research Practicum. Research with the guidance of individual faculty members on problems of mutual interest. [3]

SOC 395b. Research Practicum. Research with the guidance of individual faculty members on problems of mutual interest. [3]

SOC 399. Ph.D. Dissertation Research.

SOC 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

SPAN 101g. Spanish for Graduate Reading. Survey of grammar and vocabulary, with extensive reading. Available only to graduate students for "No Credit". [0]

SPAN 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 con-

sidered. Emphasis on non-standard dialectal varieties of Spanish. Prerequisite: 201W and 202. [3]

SPAN 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. Prerequisite: 201W and 202. [3]

SPAN 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. Prerequisite: 201W and 202. [3]

SPAN 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. Prerequisite: 201W and 202. [3]

SPAN 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. Prerequisite: 201W and 202. [3]

SPAN 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. Prerequisite: 201W and 202. [3]

SPAN 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. Prerequisite: 203. [3]

SPAN 232. Literature of the Spanish Golden Age. Representative works from early modern Spain, including poetry, prose, and drama of the Renaissance and Baroque periods. Prerequisite: 203. [3]

SPAN 233. Modern Spanish Literature. The eighteenth and nineteenth centuries: essays and Neoclassic literature, Romanticism, Realism, and Naturalism. Representative works and authors from all genres. Prerequisite: 203. [3]

SPAN 234. Contemporary Spanish Literature. Representative authors and works from the Generation of 1898 to the present. Prerequisite: 203. [3]

SPAN 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. Prerequisite: 203. [3]

SPAN 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. Prerequisite: 203. [3]

SPAN 237. Contemporary Lyric Poetry. From Modernism to the present in Spain and Spanish America. Prerequisite: 203. [3]

SPAN 239. Development of the Novel. From the seventeenth century through Realism and Naturalism in Spain and Spanish America. Prerequisite: 203. [3]

SPAN 244. Afro-Hispanic Literature. From nineteenth-century slave narrative to modern writers such as Miguel Barnet, Alejo Carpentier, and Quince Duncan. Prerequisite: 203. [3]

SPAN 246. *Don Quixote.* Directed reading and intensive study of the novel. Prerequisite: 203. [3]

SPAN 247. Spanish-American Literature of the Boom Era. The Boom novel of the 1960s: Carlos Fuentes' *La muerte de Artemio Cruz,* Julio Cortázar's *Rayuela,* Mario Vargas Llosa's *La ciudad y los perros,* Guillermo Cabrera Infante's *Tres tristes tigres,* and Gabriel Garcìa Márquez's *Cien años de soledad.* Prerequisite: 203. [3]

SPAN 248. Spanish-American Literature of the Post-Boom Era. The post-Boom novel from the 1970s to the present; analysis of related films. Manuel Muig's *Boquitas pintadas, Me llamo Rigoberta Menchú,* Laura Esquivel's *Coma agua para chocolate,* Reinaldo Arena's *Viaje a La Habana,* and Daisey Rubiera Castillo's *Reyita, sencillamente.* Prerequisite: 203. [3]

SPAN 251. Development of Drama. Spanish theatrical works from 1600 to 1900, including the Golden age comedia, neoclassicism, romanticism, and early realism in drama. Prerequisite: 203. [3]

SPAN 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. Prerequisite: 203. [3]

SPAN 260. Development of the Short Story. From early manifestations in Spain through its current forms in Spain and Spanish America. Prerequisite: 203. [3]

SPAN 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. Prerequisite: 203. [3]

SPAN 275. Latina and Latin American Women Writers. Contemporary writing of women in Latin America and of Latinas in the United States. Representation of sexuality and the maternal body. Prerequisite: 203. [3]

SPAN 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. Prerequisite: 203. [3]

SPAN 281. The Theory and Practice of Drama. Critical works and plays from different periods. Introduction to the principles of dramaturgy. Prerequisite: 203. [3]

SPAN 283. Spanish in Society. Language variation and linguistic change. Regional, socioeconomic, gendered, and ethnic differences in spoken Spanish. Language as it shapes the identities of speakers. Language use in social contexts with comparisons to English. Prerequisite: 203. [3]

SPAN 285. Discourse Analysis. Linguistic pragmatics. Speech acts in conversation as patterned activity rather than unpredictable behavior. Implications, presuppositions, discourse markers, and other pragmatic units. Comparisons with English. Prerequisite: 203. [3]

SPAN 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. [Variable credit: 1–3 each semester, not to exceed 12 over a four-semester period]

SPAN 294. Special Topics in Hispanic Literature. Prerequisite: 203. [May be repeated for credit if there is no duplication of topic] [3]

SPAN 295. Special Topics in Spanish Language and Linguistics. Prerequisite: 203. [May be repeated for credit if there is no duplication of topic] [3]

SPAN 296. Special Topics in Hispanic Culture. Prerequisite: 203. [May be repeated for credit if there is no duplication of topic. [3]

SPAN 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. [3]

SPAN 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. [3]

SPAN 303. Research and Grant Proposal Writing. Designed for humanities students. Practice in writing proposals; step-by-step creation of proposals; peer evaluation. [2]

SPAN 310. Foreign Language Learning and Teaching. (Also listed as Portuguese 310.) Designed for departmental teaching assistants. Intro-

duction to language teaching methodologies and assessment. Focus on practical applications. [1]

SPAN 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]

SPAN 330. Survey of Medieval Spanish Literature. Introduction to major works of pre-modern Spanish literature through the fifteenth century. [3]

SPAN 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]

SPAN 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]

SPAN 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]

SPAN 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. [3]

SPAN 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]

SPAN 338. Seminar: Studies in Colonial Literature. (Also listed as Portuguese 338) [3]

SPAN 340. Seminar: Hispanic American Essay. (Also listed as Portuguese 340) [3]

SPAN 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. [3]

SPAN 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. [3]

SPAN 343. Seminar: Studies in Golden Age Drama. The comedia nueva in cultural and critical contexts. [3]

SPAN 344. Seminar: The Baroque. Readings in Spanish baroque literature and culture, including works by Góngora, Quevedo, Cervantes, María de Zayas, Calderón, and Gracián. [3]

SPAN 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. [3]

SPAN 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. [3]

SPAN 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]

SPAN 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]

SPAN 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. [3]

SPAN 362. Seminar: The Realist Novel of the Nineteenth-Century. 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]

SPAN 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]

SPAN 369. Master's Thesis Research. [0]

SPAN 372. Seminar: Studies in Twentieth-Century Spanish Literature. Topics vary. [3]

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

SPAN 387. Seminar: Contemporary Spanish American Novel. [3]

SPAN 388. Special Topics in Spanish Literature. Topics vary. [3]

SPAN 389. Special Topics in Spanish American Literature. Topics vary. For list of previous topics, please see departmental Web page. [3]

SPAN 396. Special Studies in Spanish Linguistics. [Variable credit: 1–6]

SPAN 397. Special Studies in Spanish Literature. [Variable credit: 1–6]

SPAN 398. Special Studies in Spanish American Literature. [Variable credit: 1–6]

SPAN 399. Ph.D. Dissertation Research.

SPAN 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

SPED 3000. Education and Psychology of Exceptional Learners. Presents an overview of people who are labeled "exceptional" and the implications for education related to them. Examines the disabilities that people have and services, systems, and concepts associated with them. Includes 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. Discuss trends and issues related to the areas of exceptionality and relate these to previous trends, issues, and attitudes. [3]

SPED 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. [3]

SPED 3011. Proseminar II: Contrasting Research Methodologies in Special Education Research. The purpose of this course is to provide 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. [3]

SPED 3012. Research Design in Special Education. Provides 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. [3]

SPED 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. [3]

SPED 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: 3013, 3210. [3]

SPED 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, 3013. [1]

SPED 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]

SPED 3030. Advanced Issues in Family Intervention. Provides information on 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 94-142 and 99-457. [3]

SPED 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.)

SPED 3050. Augmentative and Alternative Communication. This course is designed to provide an overview of the field of augmentative and alternative communication (AAC) for use with young children and school-age children with severe disabilities. Specifically, the course will provide an overview of the theories that are important to the understanding of appropriate uses of AAC 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 AAC systems. [3]

SPED 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] Artiles.

SPED 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, Family Service Plans. Proper APA citation and writing about laws and cases. [3] (Not currently offered)

SPED 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]

SPED 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. Prerequisite: consent of instructor. [1-3]

SPED 3130. Advanced Field Work in Special Education. The second practicum for graduate and professional students majoring or minoring in any area of exceptionality, with opportunity for supervised participation in community special education programs. Prerequisite: consent of instructor. [1-3]

SPED 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 permission of department. [6]

SPED 3210. Management Procedures for Academic and Social Behavior. Application of behavioral principles in educational settings. Presents definition and measurement of behavior, reinforcement strategies, systematic program development, basic formats for classroom instruction, and techniques for monitoring student progress. Emphasizes 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. [3]

SPED 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]

SPED 3250. Proseminar in Mental Retardation. (Also listed as PSY 325P) Variable topics. May be repeated with change in topic. [2]

SPED 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 is 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. [3]

SPED 3310. Transition for Persons with Disabilities. Theory and practice of transition from school to community living and employment for young adults with disabilities. Legislative history and practical applications of skills such as job development and job placement. Prerequisite: 3300. [3]

SPED 3320. Advanced Transition for Persons with Disabilities. Extends 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]

SPED 3330. Advanced Procedures for Students with Multiple Disabilities. Information on 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 is placed on environmental adaptations and direct training needed to maximize independence as deter-

mined through systematic ecological inventories. Information is provided on physical and medical management. Competencies in research-based programming are provided. [3]

SPED 3360. Advanced Procedures for Transition to Adult Life. Graduate-level course in advanced procedures in community and employment integration of persons with disabilities. Strategies introduced that may be applied on four levels in order to facilitate integration, including (a) individual, (b) school or workplace, (c) community, and (d) systems-wide levels. Students implement interventions in school, work, or community settings. [3]

SPED 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]

SPED 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]

SPED 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]

SPED 3510. Educational Procedures for Visually Impaired Learners. Introduction to the literature, history, principles, programs, practices, and problems in the field. Administration, curricular, and methodological adaptations for various educational programs. The education of individuals with visual impairments and other accompanying disabilities. [3]

SPED 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. [3]

SPED 3550. Orientation and Mobility Skills for Teachers of the Visually Impaired. Lectures, discussions, and simulated activities in teaching orientation, mobility concepts, and skills to visually impaired individuals. Offered by a mobility specialist. [3]

SPED 3580. Advanced Procedures for Visually Impaired Learners. Topics relate to assessment, social skills development, transitions, career development, consumerism, and other unique areas of the core curriculum for visually impaired learners. [3]

SPED 3590. Advanced Orientation and Mobility Skills for Teachers of the 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 and/or consent of instructor. [3]

SPED 3600. Speech and Language for Exceptional Learners. An overview of normal language development, psycholinguistic theory, and research. Emphasis is on specific intervention procedures useful for teachers of children and youth with severe/profound or mild/moderate disabling conditions. [3]

SPED 3690. Master's Thesis Research. Open only to candidates for the Master of Science degree engaged in thesis research andf writing. Consent of major professor required. [Variable credit 0-6]

SPED 3700. Applications of Technology in the Classroom. Examines the use of computer-based instruction and management systems to facilitate classroom instruction. The course includes issues related to the integration of technology into instructional design, a review and analysis of educational software, an exploration of educational considerations of technology for individuals with disabilities, an evaluation of assistive technology options, and an overview of instructional and managerial computer applications. [3] (Not currently offered)

SPED 3710. Advanced Applications of Technology in the Classroom. Presents and examines models and techniques of instruction for integrating computer and technology into special education classroom curricula. Focuses on the development, implementation, and advanced instructional and managerial applications of technology when used with disabled individuals. Prerequisite: 3700 or equivalent. [3] (Not currently offered)

SPED 3790. Non-Candidate Research. Research prior to entry into candidacy (completion of qualifying examination) and for special non-degree students. [Variable credit: 0-12]

SPED 3800. Advanced Trends and Issues in Learning Disabilities. Provides advanced study of current trends, research, and issues in mild/moderate disabilities with specific emphasis on learning disabilities. Historical perspectives and theoretical models are reviewed along with empirical research related to definitions, identification procedures, conceptualizations, educational strategies, and service delivery options for individuals with learning disabilities. [3]

SPED 3810. Advanced Trends and Issues for Students with Behavior Disorders. This course focuses on an historical overview and analysis of theoretical issues regarding etiology and treatment of severe behavior disorders. The course reviews definitions, historical development, contributing factors, and major classifications of behavior disorders. An overview of research methods used in treating disordered behavior is presented. Ability to analyze, synthesize, and apply research methods related to prevention and management strategies with children and adolescents is required. [3]

SPED 3820. Advanced Issues and Procedures in the Assessment of Students with Mild/Moderate Disabilities. This course focuses on 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 is on the interpretation of information from assessments into Individualized Education Program annual goals and objectives and instructional programming strategies. Specific consideration is given to the reporting of assessment information to parents, teachers and other support personnel to determine appropriate placement levels within the continuum of services. Practical application is required. [3]

SPED 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. [3]

SPED 3830. Advanced Instructional Principles and Procedures in Mathematics for Students with Disabilities. The purpose of this course is to teach students principles of remediation in mathematics for students with disabilities and those at risk for academic failure. Throughout the course, emphasis is placed on instructional procedures and use of manipulatives for establishing a remedial instruction program in mathematics. [3]

SPED 3835. Advanced Instructional Principles and Procedures in Writing and Language. This course focuses on how to teach writing and language skills to students with high incidence disabilities. This course examines writing and language development, the written and language difficulties encountered by students with high incidence disabilities, assessment and instruction of writing and language difficulties, as well as cultural diversity and writing and language differences. This course involves students learning how to apply specific instructional programs in writing. The course focuses on the explicit teaching procedures as well as the use of technology for teaching writing/language skills. [3]

SPED 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]

SPED 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. [3]

SPED 3850. Consultation Strategies for Teachers of Students with Mild/Moderate Disabilities. Reviews the history, theory, and research associated with models of school consultation with an emphasis on behavioral consultation. Students learn to use behavioral consultation to help teachers better accommodate individuals with social and academic problems in their classrooms. More briefly examines interdisciplinary consultation strategies involving parents, medical, vocational, career, and social work professionals. Prerequisite: 3800 or 3860. [3] (Not currently offered)

SPED 3860. Advanced Procedures in Classroom Management and Social Skills Instruction for Students with Mild/Moderate Disabilities. Focuses on current teaching practices in the field, with an emphasis on examination of research bases of effective teaching with students with behavior problems. Covers 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. [3]

SPED 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. [3] (Not currently offered)

SPED 3880. Teaching Special Education in Secondary Schools. This course consists of two components. The first 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 focuses on empirically-based test taking, study, self-monitoring, and self-advocacy strategies. Accommodations for students with disabilities within content areas are also emphasized.[2].

SPED 3930. Seminar in Special Education. Enables students to explore and acquire depth in special topic areas directly related to their own objectives. [1-4]

SPED 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. [1-3]

SPED 3937. Seminar: Issues and Trends in Early Childhood Special Education. Topical seminar in research issues relevant to early childhood/special education. [1-3]

SPED 3950. Internship in Special Education. Supervised on-site experience in a professional role. Opportunity to demonstrate advanced competencies while serving as teacher, counselor, research associate, administrative aide, or other member of professional teams. Consent of major professor required. [1-12]

SPED 3960. Readings and Research in Special Education. Individual programs of reading or research for students. May be repeated. Consent of instructor required. [1-3]

SPED 3990. Ph.D. Dissertation Research.

SPED 3995. Half-time Ph.D. Dissertation Research. Ph.D. Dissertation Research. For students who have completed 72 hours and devote a half-time effort to dissertation research. [0]

Women's and Gender Studies

WGS 201. Women and Gender in Transnational Context. Gender as a social construction. Feminist critiques of knowledge, family and work, sexuality, health and medicine, and the women's movement. The future of feminism in global context. [3]

WGS 301. Gender and Sexuality: Feminist Approaches. Interdisciplinary introduction to the major debates, theoretical terms, and research methods in feminist, gender, sexuality, and queer studies. [3]

WGS 302. Gender and Pedagogy. Feminist theories of teaching and learning; gender and diversity in the classroom; critical pedagogy. [1]

WGS 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. [Variable credit: 1–3 each semester]

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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.

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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
2009 RONALD D. SCHRIMPF, Orrin Henry Ingram Professor of Engineering; Professor of Electrical Engineering; Professor of Computer Engineering
2010 WILLIAM SCHAFFNER, Professor of Preventive Medicine and Chair of the Department; Professor of Medicine

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
2009 C. NEAL TATE, Professor of Political Science and Chair of the Department; Professor of Law
2010 NANCY J. KING, Lee S. and Charles A. Speir Professor of Law

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 PICHOIS, 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
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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
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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
2008 LENN E. GOODMAN, Andrew W. Mellon Professor of Humanities; Professor of Philosophy
2009 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

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
2009 DANA D. NELSON, Gertrude Conaway Vanderbilt Professor of English; Professor of English
2010 DAVID S. KOSSON, Professor of Civil and Environmental Engineering and Chair of the Department; Professor of Chemical Engineering; Professor of Earth and Environmental Sciences

University Professorships

HOUSTON A. BAKER, JR., University Distinguished Professor of English
JOHN C. GORE, Hertha Ramsey Cress University Professor of Radiology and Radiological Sciences and Biomedical Engineering; Professor of Physics; Professor of Molecular Physiology and Biophysics
GEORGE M. HORNBERGER, Distinguished University Professor; Craig E. Philip Professor of Engineering
PETER LAKE, University Distinguished Professor of History and the History of Christianity
LAWRENCE J. MARNETT, University Professor of Biochemistry, Chemistry, and Pharmacology, and Mary Geddes Stahlman Professor of Cancer Research
RANDOLPH A. MILLER, Donald A. B. and Mary M. Lindberg University Professor of Biomedical Informatics, Medicine, and Nursing
EDWARD RUBIN, University Professor of Law and Political Science
W. KIP VISCUSI, University Distinguished Professor of Law, Economics, and Management
JOHN P. WIKSWO, JR., Gordon A. Cain University Professor; A. B. Learned Professor in Living State Physics

Named and Distinguished Professorships and Chairs

DALE P. ANDREWS, Distinguished Professor of Homiletics and Social Justice
ELLEN T. ARMOUR, E. Rhodes and Leona B. Carpenter Associate Professor of Feminist Theology
CARLOS L. ARTEAGA, Vice Chancellor's Professor of Breast Cancer Research
MICHAEL ASCHNER, Gray E. B. Stahlman Professor of Neuroscience
DAVID M. BADER, Gladys Parkinson Stahlman Professor of 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)
R. DANIEL BEAUCHAMP, John Clinton Foshee Distinguished Professor of Surgery
MICHAEL D. BESS, Chancellor's Professor of History
JOSEPH D. BLACKBURN, JR., James A. Speyer Professor of Production Management
RICHARD BLACKETT, Andrew Jackson Professor of American History
RANDY D. BLAKELY, Allan D. Bass Professor of Pharmacology
ERIC W. BOND, Joe L. Roby Professor of Economics
RICHARD M. BREYER, John B. Youmans Professor of Medicine
KENDAL SCOT BROADIE, Stevenson Professor of Neurobiology
H. ALEX BROWN, Ingram Associate Professor of Cancer Research
NANCY J. BROWN, Robert H. Williams Professor of Medicine
J. PATOUT BURNS, Edward A. Malloy Professor of Catholic Studies
RICHARD M. CAPRIOLI, Stanley Cohen Professor of Biochemistry
DAVID P. CARBONE, Harold L. Moses Professor of Cancer Research
WALTER J. CHAZIN, Chancellor's Professor of Biochemistry and Physics
ALAN D. CHERRINGTON, Jacquelyn A. Turner and Dorothy J. Turner Professor of Diabetes Research
WILLIAM G. CHRISTIE, Frances Hampton Currey Professor of Finance
LARRY R. CHURCHILL, Ann Geddes Stahlman Professor of Medical Ethics
ELLEN WRIGHT CLAYTON, Rosalind E. Franklin Professor of Genetics and Health Policy
JAY CLAYTON, William R. Kenan Jr. Professor of English
ROBERT J. COFFEY, John B. Wallace Professor of Medicine
MARK A. COHEN, Justin Potter Distinguished Professor of American Competitive Business
ROBERT D. COLLINS, John L. Shapiro Professor of Pathology
BRUCE E. COMPAS, Patricia and Rodes Hart Professor of Psychology and Human Development
ALAIN CONNES, Distinguished Professor of Mathematics
BRUCE COOIL, Dean Samuel B. and Evelyn R. Richmond Professor of Management (Statistics)
PETER T. CUMMINGS, John R. Hall Professor of Chemical Engineering
RICHARD L. DAFT, Brownlee O. Currey Jr. Professor of Management (Organizational Studies)
RICHARD T. D'AQUILA, Addison B. Scovile Professor of Medicine
STEPHEN NEIL DAVIS, Mark Collie Professor of Diabetes Research
COLIN DAYAN, Robert Penn Warren Professor in the Humanities
ARTHUR A. DEMAREST, Ingram Professor of Anthropology
DENNIS C. DICKERSON, James M. Lawson Jr. Professor of History
TOM DILLEHAY, Distinguished Professor of Anthropology
RAYMOND N. DUBOIS, JR., Mina Cobb Wallace Chair in Gastroenterology and Cancer Prevention
TONY LEE EARLEY, Samuel Milton Fleming Professor of English
JAMES W. ELY, JR., Milton R. Underwood Chair in Free Enterprise
RONALD B. EMESON, Joel G. Hardman Professor of Pharmacology
LYNN ENTERLINE, Chancellor's Professor of English
JAMES A. EPSTEIN, Distinguished Professor of History
ELLEN H. FANNING, Stevenson Professor of Biological Sciences
LEONARD C. FELDMAN, Stevenson Professor of Physics
EDWARD H. FRIEDMAN, Chancellor's Professor of Spanish
MARILYN A. FRIEDMAN, W. Alton Jones Professor of Philosophy
RAYMOND A. FRIEDMAN, Brownlee O. Currey Professor of Management (Organization Studies)
MARK E. FRISSE, Accenture Professor of Biomedical Informatics
LUKE M. FROEB, William and Margaret Oehmig Associate Professor of Free Enterprise and Entrepreneurship
JOHN G. GEER, Distinguished Professor of Political Science
ALFRED L. GEORGE, JR., Grant W. Liddle Professor of Medicine
GARY GERSTLE, James Stahlman Professor of History
JAMES RICHARD GOLDENRING, Paul W. Sanger Professor of Experimental Surgery
MICHAEL GOLDFARB, H. Fort Flowers Professor of Mechanical Engineering
LENN E. GOODMAN, Andrew W. Mellon Professor of Humanities
BARBARA HAHN, Distinguished Professor of German
JONATHAN LEE HAINES, T. H. Morgan Professor of Human Genetics
DENNIS E. HALLAHAN, Ingram Professor of Cancer Research
JOSEPH H. HAMILTON, Landon C. Garland Distinguished Professor of Physics
HEIDI ELIZABETH HAMM, Earl W. Sutherland Jr. Professor of Pharmacology
JACEK HAWIGER, Oswald T. Avery Distinguished Professor of Microbiology and Immunology

GERALD B. HICKSON, Joseph C. Ross Professor of Medical Education and Administration
GEORGE C. HILL, Levi Watkins Jr. Professor and Associate Dean for Diversity in Medical Education
PETER C. HODGSON, Charles G. Finney Professor of Theology
GEORGE M. HORNBERGER, Distinguished University Professor; Craig E. Philip Professor of Engineering
JAMES HUDNUT-BEUMLER, Anne Potter Wilson Distinguished Professor of American Religious History
BILLY GERALD HUDSON, Elliott V. Newman Professor of Medicine
DAWN IACOBUCCI, E. Bronson Ingram Professor of Marketing
TADASHI INAGAMI, Stanford Moore Professor of Biochemistry
LARRY W. ISAAC, Distinguished Professor of Sociology
MARK JARMAN, Centennial Professor of English
ROBIN M. JENSEN, Luce Chancellor's Professor of the History of Christian Worship and Art
CHRISTOPHER M. S. JOHNS, Norman L. and Roselea J. Goldberg Professor of History of Art
CATHY LOGIN JRADE, Chancellor's Professor of Spanish
JON H. KAAS, Distinguished Professor of Psychology
GENNADI KASPAROV, Stevenson Professor of Mathematics
DOUGLAS S. KERNODLE, David E. Rogers Associate Professor of Medicine
MICHAEL KREYLING, Gertrude Conaway Vanderbilt Professor of English
VERA M. KUTZINSKI, Martha Rivers Ingram Professor of English
JONATHAN LAMB, Andrew W. Mellon Professor in the Humanities
M. DOUGLAS LEVAN, J. Lawrence Wilson Professor of Engineering
AMY-JILL LEVINE, Carpenter Professor of New Testament Studies
CRAIG M. LEWIS, Madison S. Wigginton Professor of Management
WILLIAM LUIS, Chancellor's Professor of Spanish
ELIZABETH LUNBECK, Nelson Tyrone Jr. Professor of American History
MARK A. MAGNUSON, Earl W. Sutherland Jr. Professor of Molecular Physiology and Biophysics
HAROLD G. MAIER, David Daniels Allen Professor of Law
SALVATORE T. MARCH, David K. Wilson Professor of Management
LEAH S. MARCUS, Edwin Mims Professor of English
LAWRENCE J. MARNETT, University Professor of Biochemistry, Chemistry, and Pharmacology, and Mary Geddes Stahlman Professor of Cancer Research
RONALD W. MASULIS, Frank K. Houston Professor of Management (Finance)
LYNN M. MATRISIAN, Ingram Professor of Cancer Research
LARRY MAY, W. Alton Jones Professor of Philosophy
JOHN S. MCCLURE, Charles G. Finney Professor of Homiletics
RALPH MCKENZIE, Distinguished Professor of Mathematics
M. DOUGLAS MEEKS, Cal Turner Chancellor's Professor of Wesleyan Studies
HERBERT Y. MELTZER, Bixler/Johnson/Mays Professor of Psychiatry
BONNIE J. MILLER-MCLEMORE, Carpenter Professor of Pastoral Theology
HAROLD L. MOSES, Hortense B. Ingram Professor of Molecular Oncology
GREGORY R. MUNDY, John A. Oates Professor of Medicine and Pharmacology
ERIC G. NEILSON, Hugh J. Morgan Professor of Medicine
DANA D. NELSON, Gertrude Conaway Vanderbilt Professor of English
JOHN A. OATES, Thomas F. Frist Professor of Medicine
C. ROBERT O'DELL, Distinguished Research Professor of Astrophysics
KELLY OLIVER, W. Alton Jones Professor of Philosophy
NEIL OSHEROFF, John Coniglio Professor of Biochemistry
ROBERT H. OSSOFF, Guy M. Maness Professor of Otolaryngology
SOKRATES T. PANTELIDES, University Distinguished Professor; William A. and Nancy F. McMinn Professor of Physics
FRANK L. PARKER, Distinguished Professor of Environmental and Water Resources Engineering
JOHN S. PENN, Phyllis G. and William B. Snyder M.D. Professor of Ophthalmology and Visual Sciences
JOHN A. PHILLIPS III, David T. Karzon Professor of Pediatrics
JENNIFER A. PIETENPOL, B. F. Byrd Jr. Professor of Oncology
PETER N. PINTAURO, H. Eugene McBrayer Professor of Chemical Engineering
DAVID BRENT POLK, Vanderbilt Dean's Professor of Pediatrics
NED ALLEN PORTER, Stevenson Professor of Chemistry
ALVIN C. POWERS, Joe C. Davis Professor of Biomedical Sciences
RONALD R. PRICE, Godfrey Hounsfield Professor of Radiology and Radiological Sciences
JENNIFER F. REINGANUM, E. Bronson Ingram Professor of Economics
J. ANN RICHMOND, Ingram Professor of Cancer Research
L. JACKSON ROBERTS II, T. Edwin Rogers Professor of Pharmacology
DAVID ROBERTSON, Elton Yates Professor of Autonomic Disorders
DAN M. RODEN, William Stokes Professor of Experimental Therapeutics
EDWARD L. RUBIN, John Wade–Kent Syverud Professor of Law
SAMUEL ANDREW SANTORO, Dorothy B. and Theodore R. Austin Professor of Pathology
JACK M. SASSON, Mary Jane Werthan Professor of Jewish Studies and Hebrew Bible
JEFFREY D. SCHALL, E. Bronson Ingram Professor of Neuroscience
RONALD D. SCHRIMPF, Orrin Henry Ingram Professor of Engineering
LARRY L. SCHUMAKER, Stevenson Professor of Mathematics
CHARLES E. SCOTT, Distinguished Professor of Philosophy
FERNANDO F. SEGOVIA, Oberlin Graduate Professor of New Testament
TRACY SHARPLEY-WHITING, Distinguished Professor of African American and Diaspora Studies and French
RICHARD C. SHELTON, James G. Blakemore Research Professor of Psychiatry
HELMUT WALSER SMITH, Martha Rivers Ingram Professor of History
SUBRAMANIAM SRIRAM, William C. Weaver III Professor of Experimental Neurology
WILLIAM W. STEAD, McKesson Foundation Professor of Biomedical Informatics
HANS R. STOLL, Anne Marie and Thomas B. Walker Jr. Professor of Finance
KEVIN STRANGE, John C. Parker Professor of Anesthesiology
GARY ALLEN SULIKOWSKI, Stevenson Professor of Chemistry
JANOS SZTIPANOVITS, E. Bronson Ingram Distinguished Professor of Engineering
CECELIA TICHI, William R. Kenan Jr. Professor of English
DANIEL H. USNER, JR., Holland M. McTyeire Professor of History
DOUGLAS E. VAUGHAN, C. Sidney Burwell Professor of Medicine
BART VICTOR, Cal Turner Professor of Moral Leadership
DAVID H. WASSERMAN, Ronald E. Snato Professor of Diabetes Research
DAVID J. WASSERSTEIN, Eugene Greener Jr. Professor of Jewish Studies
MICHAEL R. WATERMAN, Natalie Overall Warren Distinguished Professor of Biochemistry
MATTHEW BRET WEINGER, Norman Ty Smith Professor of Patient Safety and Medical Simulation
ROBERT E. WHALEY, Valere Blair Potter Professor of Management
JOHN P. WIKSWO, JR., Gordon A. Cain University Professor; A. B. Learned Professor in Living State Physics

Centennial Professorships

RANDOLPH BLAKE, Centennial Professor of Psychology
EMMANUELE DIBENEDETTO, Centennial Professor of Mathematics
JOHN LACHS, Centennial Professor of Philosophy
GORDON D. LOGAN, Centennial Professor of Psychology
ALEXANDER OLSHANSKIY, Centennial Professor of Mathematics
MARK V. SAPIR, Centennial Professor of Mathematics
MITCHELL A. SELIGSON, Centennial Professor of Political Science
DAVID CHARLES WOOD, Centennial Professor of Philosophy

Faculty

D. KILPATRICK ABBOT, Assistant Professor of Biological Sciences
B.Sc. (Georgia 1989); M.Sc. (Simon Fraser 1994); Ph.D. (Arizona 2002) [2003]

SARKI A. ABDULKADIR, Associate Professor of Pathology; Associate Professor of Cancer Biology
B.S., M.D. (Ahmadu Bello [Nigeria] 1984, 1990); Ph.D. (Johns Hopkins 1995) [2005]

TY WILLIAM ABEL, Assistant Professor of Pathology
B.A. (Boise State 1989); M.S., Ph.D., M.D. (Arizona 1991, 1993, 2001) [2005]

MARK DAVID ABKOWITZ, Professor of Civil and Environmental Engineering; Professor of Engineering Management
B.S., M.S., Ph.D. (Massachusetts Institute of Technology 1974, 1976, 1980) [1987]

BASSEL W. ABOU-KHALIL, Professor of Neurology; Director, Division of Epilepsy
B.S., M.D. (American University of Beirut 1974, 1978) [1988]

BROOKE ANN ACKERLY, Associate Professor of Political Science
B.A. (Williams 1988); M.A., Ph.D. (Stanford 1993, 1997) [2001]

JULIE A. ADAMS, Associate Professor of Computer Science; Assistant Professor of Computer Engineering
B.S., B.B.A. (Siena 1989, 1990); M.S.E., Ph.D. (Pennsylvania 1993, 1995) [2002]

RASHID M. AHMAD, Assistant Professor of Cardiac Surgery; Assistant Professor of Biomedical Informatics
Sc.B. (Brown 1988); M.D. (Columbia 1992) [2002]

JOHN F. AHNER, Professor of Mathematics
B.A., Ph.D. (Delaware 1967, 1972) [1974]

CHRISTOPHER R. AIKEN, Professor of Microbiology and Immunology
B.S. (California, Santa Barbara 1983); Ph.D. (Illinois 1991) [1995]

ROYAL G. ALBRIDGE, Professor of Physics, Emeritus
B.S. (Ohio State 1955); Ph.D. (California, Berkeley 1960) [1961]

AKRAM ALDROUBI, Professor of Mathematics
M.S. (Swiss Federal Institute of Technology 1982); Ph.D. (Carnegie-Mellon 1987) [1997]

MICHAEL L. ALLES, Research Associate Professor of Electrical Engineering
B.E., M.S., Ph.D. (Vanderbilt 1987, 1990, 1992) [2003]

ADAM W. ANDERSON, Associate Professor of Biomedical Engineering; Associate Professor of Radiology and Radiological Sciences; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Williams 1982); M.S., M.Phil., Ph.D. (Yale 1984, 1986, 1990) [2002]

KATHRYN H. ANDERSON, Professor of Economics
B.A. (Kentucky 1972); M.Econ., Ph.D. (North Carolina State 1974, 1978) [1980]

VICTOR ANDERSON, Professor of Christian Ethics; Professor of African American and Diaspora Studies; Professor of Religious Studies
A.B. (Trinity Christian 1982); M.Div., Th.M. (Calvin Theological Seminary 1986, 1990); M.A., Ph.D. (Princeton 1991, 1992) [1992]

CLAUDIA D. ANDL, Assistant Professor of Surgery; Assistant Professor of Cancer Biology
M.S. (Heidelberg [Germany] 1997); Ph.D. (Essen [Germany] 2001) [2008]

ELLEN T. ARMOUR, E. Rhodes and Leona B. Carpenter Associate Professor of Theology; Director, Carpenter Program in Religion, Gender and Sexuality; Associate Professor of Philosophy; Interim Chair, Department of Religious Studies
B.A. (Stetson 1980); M.A., Ph.D. (Vanderbilt 1989, 1993) [2006]

RICHARD N. ARMSTRONG, Professor of Biochemistry; Professor of Chemistry
B.S. (Western Illinois 1970); Ph.D. (Marquette 1975) [1995]

DOMINIK ARONSKY, Associate Professor of Biomedical Informatics; Associate Professor of Emergency Medicine
M.D. (Berne [Switzerland] 1989); Ph.D. (Utah 2000) [2000]

CARLOS L. ARTEAGA, Vice Chancellor's Professor of Breast Cancer Research; Professor of Medicine; Professor of Cancer Biology
M.D. (Guayaquil 1979) [1988]

JUDY LYNN ASCHNER, Professor of Pediatrics; Julia Carell Stadler Professor of Neonatology; Director, Division of Neonatology; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Union 1977); M.D. (Rochester 1981) [2004]

MICHAEL ASCHNER, Gray E. B. Stahlman Professor of Neuroscience; Professor of Pediatrics; Professor of Pharmacology; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.S., M.S., Ph.D. (Rochester 1980, 1983, 1985) [2004]

DANIEL H. ASHMEAD, Professor of Hearing and Speech Sciences; Associate Professor of Psychology, College of Arts and Science; Investigator, Vanderbilt Kennedy Center for Research on Human Development
Sc.B. (Brown 1976); Ph.D. (Minnesota 1983) [1984]

JEREMY ATACK, Professor of Economics; Professor of History
B.A. (Cambridge 1971); Ph.D. (Indiana 1976) [1993]

CAROL ATKINSON, Assistant Professor of Political Science
B.S. (U.S. Air Force Academy 1984); M.A. (Indiana 1985); M.A. (Air Command and Staff College 1999); M.A., Ph.D. (Duke 2002, 2003) [2008]

JAMES B. ATKINSON III, Professor of Pathology
B.A., M.D., Ph.D. (Vanderbilt 1973, 1981, 1981) [1985]

THOMAS M. AUNE, Professor of Medicine; Associate Professor of Microbiology and Immunology
B.S. (Rhodes 1973); Ph.D. (Tennessee, Memphis 1976) [1995]

MICHAEL L. AURBACH, Professor of Art
B.A., B.S.J., M.A., B.F.A. (Kansas 1974, 1976, 1979, 1981); M.F.A. (Southern Methodist 1983) [1986]

MALCOLM JOHN AVISON, Professor of Radiology and Radiological Sciences; Professor of Neurology; Professor of Pharmacology; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Cambridge 1979); M.Phil., Ph.D. (Yale 1985, 1986) [2003]

JOHN C. AYERS, Professor of Earth and Environmental Sciences
B.S. (SUNY, College at Fredonia 1985); M.S. (Pennsylvania State 1988); Ph.D. (Rensselaer Polytechnic Institute 1991) [1991]

ANNALISA AZZONI, Assistant Professor of Hebrew Bible and Ancient Near East Studies
Laurea (Instituto di Glottologia, Università degli Studi di Milano 1989); Ph.D. (Johns Hopkins 2001) [2003]

BRIAN O. BACHMANN, Assistant Professor of Chemistry; Assistant Professor of Biochemistry
B.S. (Virginia Polytechnic Institute 1992); M.S. (Southern Methodist 1994); M.A., Ph.D. (Johns Hopkins 1997, 2000) [2003]

JO-ANNE BACHOROWSKI, Associate Professor of Psychology, College of Arts and Science; Member, Vanderbilt Kennedy Center for Research on Human Development
A.B. (Holy Cross 1980); M.S., Ph.D. (Wisconsin 1986, 1991) [1995]

DAVID M. BADER, Gladys Parkinson Stahlman Professor of Cardiovascular Research; Professor of Medicine; Professor of Cell and Developmental Biology
B.A. (Augustana 1974); Ph.D. (North Dakota 1978) [1995]

HOUSTON A. BAKER, JR., University Distinguished Professor of English; Professor of English
B.A. (Howard 1965); M.A., Ph.D. (California, Los Angeles 1966, 1968) [2006]

H. SCOTT BALDWIN, Katrina Overall McDonald Professor of Pediatrics; Professor of Cell and Developmental Biology
B.A., M.D. (Virginia 1977, 1981) [2002]

LEWIS V. BALDWIN, Professor of Religious Studies
B.A. (Talladega 1971); M.A., M.Div. (Rochester 1973, 1975); Ph.D. (Northwestern 1980) [1984]

CLIFFORD A. BALL, Professor of Management (Finance and Statistics)
B.Sc., M.Sc. (Nottingham 1974, 1975); Ph.D. (New Mexico 1980) [1990]

DEAN WILLIAMS BALLARD, Professor of Microbiology and Immunology
B.S. (Marshall 1978); M.S., Ph.D. (Illinois 1981, 1984) [1992]

ROBERT DALE BALLOU, Associate Professor of Public Policy and Education
B.A. (Stanford 1972); Ph.D. (Yale 1989) [2002]

JEFFREY R. BALSER, Vice Chancellor for Health Affairs; Dean of the School of Medicine; James Tayloe Gwathmey Clinician-Scientist Professor; Interim Chair, Department of Medical Education and Administration; Professor of Anesthesiology; Professor of Pharmacology; Investigator, Center for Molecular Neuroscience
B.S.E. (Tulane 1984); M.D., Ph.D. (Vanderbilt 1990, 1990) [1998]

THEODORE BAPTY, Research Associate Professor of Electrical Engineering
B.S. (Pennsylvania 1985); M.S., Ph.D. (Vanderbilt 1995, 1995) [1992]

SANDRA L. BARNES, Professor of Human and Organizational Development; Professor of Sociology of Religion
B.A. (Fisk 1986); M.S. (Georgia Institute of Technology 1989); M.S. (Interdenominational Theological Center 1995); Ph.D. (Georgia State 1999) [2008]

JOEY V. BARNETT, Professor of Pharmacology; Professor of Medicine; Professor of Pediatrics
B.S. (Indiana State [Evansville] 1980); Ph.D. (Vanderbilt 1986) [1992]

BRUCE BARRY, Brownlee O. Currey Professor of Management; Professor of Sociology
B.A., M.A. (Virginia 1980, 1981); Ph.D. (North Carolina 1991) [1991]

ROBERT F. BARSKY, Professor of French and Comparative Literature; Professor of English; Professor of Jewish Studies; Director of French Canadian and Québec Studies
B.A. (Brandeis 1984); M.A., Ph.D. (McGill 1987, 1992) [2003]

ERIC J. BARTH, Associate Professor of Mechanical Engineering
B.S. (California, Berkeley 1994); M.S., Ph.D. (Georgia Institute of Technology 1996, 2000) [2000]

GREGORY F. BARZ, Associate Professor of Musicology (Ethnomusicology); Associate Professor of Religion
B.M. (North Carolina School of the Arts 1982); M.A. (Chicago 1992); Ph.D. (Brown 1997) [1998]

PRODYOT K. BASU, Professor of Civil and Environmental Engineering
B.S. (Lucknow 1957); B.S. (Jadavpur 1961); M.S. (Calcutta 1963); D.S. (Washington University 1977); P.E. [1984]

FRANZ JOSEF BAUDENBACHER, Associate Professor of Biomedical Engineering
B.Sc. (Tübingen [Germany] 1985); Ph.D. (Technical University of Munich 1994) [1997]

R. DANIEL BEAUCHAMP, Chair, Section of Surgical Sciences; John Clinton Foshee Distinguished Professor of Surgery; Professor of Cell and Developmental Biology; Professor of Cancer Biology
B.S. (Texas Tech 1978); M.D. (Texas 1982) [1994]

GEORGE BECKER, Associate Professor of Sociology
B.A. (SUNY, College at New Paltz 1964); M.A. (Columbia 1968); M.S., Ph.D. (SUNY, Stony Brook 1972, 1976) [1977]

VEREEN M. BELL, Professor of English
B.A. (Davidson 1955); Ph.D. (Duke 1959) [1961]

CAMILLA P. BENBOW, Patricia and Rodes Hart Dean of Education and Human Development, Peabody College; Professor of Psychology, Peabody College; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A., M.A., M.S., Ed.D. (Johns Hopkins 1977, 1978, 1980, 1981) [1998]

CHRIS J. BENNETT, Assistant Professor of Economics
B.Comm. (Ryerson 2000); M.A. (Waterloo [Ontario] 2001); Ph.D. (Western Ontario 2008) [2008]

STEPHEN D. BENNING, Assistant Professor of Psychology, College of Arts and Science; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Rice 2000); M.A., Ph.D. (Minnesota 2004, 2006) [2006]

BRETT V. BENSON, Assistant Professor of Political Science
B.A. (Brigham Young 1998); M.A., Ph.D. (Duke 2006, 2006) [2006]

M. FRÄNCILLE BERGQUIST, Associate Dean of the College of Arts and Science; Associate Professor of Spanish
B.A., M.A., Ph.D. (Texas Tech 1968, 1970, 1977) [1977]

SUSAN BERK-SELIGSON, Associate Professor of Spanish
B.A. (City University of New York 1967); M.A. (Pittsburgh 1971); Ph.D. (Arizona 1978) [2004]

ANDREAS A. BERLIND, Assistant Professor of Physics and Astronomy
A.B. (Princeton 1995); Ph.D. (Ohio State 2001) [2007]

FRED H. BESS, Professor of Hearing and Speech Sciences; Professor of Otolaryngology; Member, Vanderbilt Kennedy Center for Research on Human Development
A.B. (Carthage 1962); M.S. (Vanderbilt 1964); Ph.D. (Michigan 1970) [1976]

MICHAEL D. BESS, Chancellor's Professor of History; Professor of European Studies
B.A. (Reed 1979); M.A., Ph.D. (California, Berkeley 1983, 1989) [1989]

ALBERT H. BETH, Professor of Molecular Physiology and Biophysics
B.S. (Murray State 1974); Ph.D. (Vanderbilt 1977) [1977]

NEIL ADRI BHOWMICK, Assistant Professor of Urologic Surgery; Assistant Professor of Cancer Biology
B.S. (Florida 1991); Ph.D. (Georgia 1998) [2003]

BHARAT L. BHUVA, Professor of Electrical Engineering; Professor of Computer Engineering
B.Sc. (Maharaja Sayajirao University of Baroda 1982); M.S., Ph.D. (North Carolina State 1984, 1987) [1987]

LEONARD BICKMAN, Betts Professor of Psychology and Human Development; Professor of Psychology, Peabody College; Director, Center for Evaluation and Program Improvement, Peabody College; Professor of Psychiatry; Investigator, Vanderbilt Kennedy Center for Research on Human Development (On leave fall 2010)
B.S. (City College of New York 1963); M.A. (Columbia 1965); Ph.D. (City University of New York 1969) [1981]

DIETMAR BISCH, Professor of Mathematics and Chair of the Department
Hauptdiplom (Universität Karlsruhe [Germany] 1987); Ph.D. (California, Los Angeles 1991) [2002]

GAUTAM BISWAS, Professor of Computer Science; Professor of Computer Engineering; Professor of Engineering Management
B.Tech. (Indian Institute of Technology, Bombay 1977); M.S., Ph.D. (Michigan State 1980, 1983) [1987]

JEFFREY DUNCAN BLACK, Research Associate Professor of Electrical Engineering
B.S. (United States Air Force Academy 1988); M.S. (New Mexico 1991); Ph.D. (Vanderbilt 2008) [2009]

JOSEPH D. BLACKBURN, JR., James A. Speyer Professor of Production Management (Operations); Professor of Management (Operations Management)
B.E. (Vanderbilt 1963); M.S. (Wisconsin 1964); Ph.D. (Stanford 1971) [1979]

RICHARD BLACKETT, Andrew Jackson Professor of American History; Professor of History
B.A. (Keele [England] 1969); M.A. (Manchester [England] 1973) [2002]

JENNIFER URBANO BLACKFORD, Assistant Professor of Psychiatry; Member, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Florida State 1990); M.S., Ph.D. (Vanderbilt 1994, 1998) [1999]

TIMOTHY S. BLACKWELL, Professor of Medicine; Professor of Cell and Developmental Biology; Professor of Cancer Biology
B.A. (Vanderbilt 1983); M.D. (Alabama 1988) [1995]

RANDOLPH BLAKE, Centennial Professor of Psychology, College of Arts and Science; Professor of Ophthalmology and Visual Sciences; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Texas 1967); M.A., Ph.D. (Vanderbilt 1969, 1972) [1988]

RANDY D. BLAKELY, Allan D. Bass Professor of Pharmacology; Professor of Psychiatry; Director, Center for Molecular Neuroscience; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Emory 1981); Ph.D. (Johns Hopkins 1987) [1995]

ROBERT W. BLANNING, Professor of Management (IT)
B.S. (Pennsylvania State 1958); M.S. (Case Western Reserve 1964); Ph.D. (Pennsylvania 1971) [1980]

MARK J. BLITON, Associate Professor of Medicine; Associate Professor of Obstetrics and Gynecology; Chief, Clinical Ethics Consultation Service, VUMC
B.A. (Allegheny 1984); Ph.D. (Vanderbilt 1993) [1993]

JAMES J. BLOOM, Assistant Professor of History of Art
B.A. (Dartmouth 1993); M.A., Ph.D. (Duke 1999, 2002) [2005]

PAUL E. BOCK, Professor of Pathology; Professor of Medicine
B.A. (California, San Diego 1971); Ph.D. (Washington University 1976) [1991]

ERIK M. BOCZKO, Assistant Professor of Biomedical Informatics
B.A. (Manhattanville 1998); Ph.D. (Carnegie Mellon 1995); Ph.D. (Georgia Institute of Technology 2002) [2002]

ROBERT E. BODENHEIMER, JR., Associate Professor of Computer Science; Associate Professor of Computer Engineering; Associate Professor of Electrical Engineering
B.S., B.A., M.S. (Tennessee 1986, 1987); Ph.D. (California Institute of Technology 1995) [2000]

GERMAIN B. BÖER, Professor of Management (Accounting)
B.S. (Saint Edwards 1960); M.B.A. (Texas Tech 1961); Ph.D. (Louisiana State 1964); C.P.A. [1977]

NICOLAS P. B. BOLLEN, E. Bronson Ingram Research Professor of Finance; Associate Professor of Management (Finance)
B.A. (Cornell 1988); M.B.A., Ph.D. (Duke 1993, 1997) [2001]

KIRILL I. BOLOTIN, Assistant Professor of Physics
B.S., M.S. (Moscow Institute of Physics and Technology [Russia] 1998, 2000); M.S., Ph.D. (Cornell 2003, 2006) [2009]

ERIC W. BOND, Joe L. Roby Professor of Economics; Professor of Economics
B.S. (Lehigh 1974); M.A., Ph.D. (Rochester 1977, 1979) [2003]

STEWART M. BOND, Assistant Professor of Nursing
B.S.N. (Virginia 1981); M.S. (North Carolina 1988); M.T.S. (Vanderbilt 1995); Ph.D. (North Carolina 2006); R.N., A.O.C.N. [2006]

A. B. BONDS, Professor of Electrical Engineering and Associate Department Chair, Department of Electrical Engineering and Computer Science; Professor of Computer Engineering and Director of the Program; Professor of Biomedical Engineering
A.B. (Cornell 1968); M.S., Ph.D. (Northwestern 1972, 1974) [1980]

WILLIAM JAMES BOOTH, Professor of Political Science; Professor of Philosophy
B.A., M.A. (McGill 1975, 1978); Ph.D. (Harvard 1982) [1996]

MARK R. BOOTHBY, Professor of Microbiology and Immunology; Professor of Medicine
B.S. (Wisconsin 1976); M.D., Ph.D. (Washington University 1983, 1983) [1992]

SETH R. BORDENSTEIN, Assistant Professor of Biological Sciences
B.S., M.S., Ph.D. (Rochester 1997, 1999, 2002) [2008]

DARRYL J. BORNHOP, Professor of Chemistry
B.S., M.A. (Missouri 1980, 1982); Ph.D. (Wyoming 1987) [2003]

ALAN RAY BOWERS, Associate Professor of Civil and Environmental Engineering
B.C.E., M.C.E., Ph.D. (Delaware 1976, 1978, 1982); P.E. [1982]

AARON B. BOWMAN, Assistant Professor of Neurology; Investigator, Center for Molecular Neuroscience; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Brigham Young 1995); Ph.D. (California, San Diego 2000) [2006]

JAMES W. BRADFORD, JR., Dean, Owen Graduate School of Management; Ralph Owen Professor of the Practice of Management
B.A. (Florida 1969); J.D. (Vanderbilt 1973) [2002]

TAMALA SELKE BRADHAM, Assistant Professor of Hearing and Speech Sciences
B.A. (Columbia College 1992); M.Aud., Ph.D. (South Carolina 1994, 1998) [2004]

LEONARD ALAN BRADSHAW, Research Assistant Professor of Surgery; Research Assistant Professor of Physics
B.S. (Abilene Christian 1990); M.S., Ph.D. (Vanderbilt 1992, 1995) [1996]

STEPHEN J. BRANDT, Professor of Medicine; Professor of Cancer Biology; Professor of Cell and Developmental Biology
B.S. (Duke 1976); M.D. (Emory 1981) [1990]

ALAN R. BRASH, Professor of Pharmacology
B.A. (Cambridge 1970); Ph.D. (Edinburgh 1973) [1977]

GENE W. BRATT, Associate Professor of Hearing and Speech Sciences; Adjunct Associate Professor of Speech Pathology at Meharry Medical College
B.A. (Calvin 1969); M.A. (Michigan State 1975); Ph.D. (Vanderbilt 1980) [1980]

CHARLES A. BRAU, Professor of Physics
B.S. (Cornell 1961); A.M., Ph.D. (Harvard 1962, 1965) [1988]

JOHN M. BRAXTON, Professor of Education
B.A. (Gettysburg 1967); M.A. (Colgate 1968); D.Ed. (Pennsylvania State 1980) [1992]

RICHARD M. BREYER, John B. Youmans Professor of Medicine; Professor of Pharmacology; Professor of Biochemistry
B.S. (Michigan 1978); M.S., Ph.D. (Massachusetts Institute of Technology 1982, 1988) [1991]

JÉRÔME BRILLAUD, Assistant Professor of French
Maîtrise, D.E.A. (Université François Rabelais, Tours [France] 1991, 1993); Agrégation (ENS rue d'Ulm and Paris III [France] 1996); Ph.D. (Harvard 2004) [2009]

BRANDI CLAY BRIMMER, Assistant Professor of History
B.A. (Spelman 1995); M.A., Ph.D. (California, Los Angeles 1999, 2006) [2006]

KENDAL SCOT BROADIE, Stevenson Professor of Neurobiology; Professor of Biological Sciences; Professor of Pharmacology; Professor of Cell and Developmental Biology; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.S. (Oregon 1989); Ph.D. (Cambridge [England] 1994) [2002]

ARTHUR J. BRODERSEN, Professor of Electrical Engineering, Emeritus; Professor of Computer Engineering, Emeritus
B.S., M.S., Ph.D. (California, Berkeley 1961, 1963, 1966) [1974]

HARRY P. BROQUIST, Professor of Biochemistry, Emeritus
B.S. (Beloit 1940); M.S., Ph.D. (Wisconsin 1941, 1949) [1969]

CHRISTOPHER BRIAN BROWN, Assistant Professor of Pediatrics; Assistant Professor of Pharmacology
B.S. (Auburn 1990); Ph.D. (Vanderbilt 1997) [2003]

H. ALEX BROWN, Professor of Pharmacology; Ingram Professor of Cancer Research; Professor of Chemistry; Professor of Biochemistry
B.S. (Florida Institute of Technology 1983); M.S. (Syracuse 1986); Ph.D. (North Carolina 1992) [2002]

NANCY J. BROWN, Robert H. Williams Professor of Medicine; Professor of Pharmacology; Associate Dean for Clinical and Translational Scientist Development
B.A. (Yale 1981); M.D. (Harvard 1986) [1992]

STEVEN HOLLOWAY BROWN, Associate Professor of Biomedical Informatics; Chief Information Officer, VAMC
A.B., M.D. (Brown 1981, 1987) [1994]

TONY N. BROWN, Associate Professor of Sociology; Fellow, Institute of Public Policy Studies
B.S. (Maryland, Eastern Shore 1991); M.A., Ph.D. (Michigan 1993, 1998) [2001]

PETER BUERHAUS, Valere Potter Chair in Nursing; Senior Associate Dean for Research, School of Nursing; Professor of Nursing
B.S.N. (Mankato State 1976); M.S.N. (Michigan 1981); Ph.D. (Wayne State 1990); R.N. [2000]

J. PATOUT BURNS, Edward A. Malloy Professor of Catholic Studies
B.A., M.A. (Spring Hill 1963, 1964); M.Div. (Regis [Canada] 1970); M.Th. (University of St. Michael's College [Canada] 1971); Ph.D. (Yale 1974) [1999]

VICTORIA A. BURRUS, Associate Professor of Spanish
B.S., M.A., Ph.D. (Wisconsin 1974, 1976, 1985) [1986]

WILLIAM S. BUSH, Assistant Professor of Biomedical Informatics
B.S. (Western Kentucky 2003); M.S., Ph.D. (Vanderbilt 2008, 2009) [2010]

JAMES P. BYRD, JR., Assistant Professor of American Religious History; Associate Dean for Graduate Education and Research, Graduate Department of Religion
B.A. (Gardner-Webb 1988); M.Div. (Duke 1991); M.A., Ph.D. (Vanderbilt 1997, 1999) [1999]

JAMES A. CADZOW, Centennial Professor of Electrical Engineering, Emeritus; Professor of Computer Engineering, Emeritus
B.S. (Buffalo 1958); M.S. (SUNY, Buffalo 1963); Ph.D. (Cornell 1964) [1988]

WILLIAM CAFERRO, Professor of History
B.A. (Haverford 1984); Ph.D. (Yale 1992) [1998]

DAVID J. CALKINS, Associate Professor of Ophthalmology and Visual Sciences
B.S. (Michigan 1989); Ph.D. (Mahoney Institute 1994) [2004]

MARY N. CAMARATA, Assistant Professor of Hearing and Speech Sciences
B.A. (San Diego State 1979); M.S. (Purdue 1983) [1998]

STEPHEN M. CAMARATA, Professor of Hearing and Speech Sciences; Associate Professor of Special Education; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.A., M.A. (San Diego State 1979, 1981); Ph.D. (Purdue 1984) [1990]

KAREN E. CAMPBELL, Associate Professor of Sociology and Associate Chair of the Department
A.B. (Randolph-Macon Woman's 1977); M.A., Ph.D. (North Carolina 1982, 1985) [1985]

JEFFREY A. CANTER, Assistant Professor of Molecular Physiology and Biophysics
B.A. (Kenyon 1977); M.D. (Cincinnati 1981); M.P.H. (Vanderbilt 2003) [2003]

RICHARD M. CAPRIOLI, Stanley Cohen Professor of Biochemistry; Professor of Pharmacology; Professor of Chemistry; Professor of Medicine; Director, Center in Mass Spectrometry; Investigator, Center for Molecular Neuroscience
B.S., Ph.D. (Columbia 1965, 1969) [1998]

DAVID P. CARBONE, Harold L. Moses Professor of Cancer Research; Professor of Medicine; Professor of Cell and Developmental Biology; Professor of Cancer Biology
B.A. (Amherst 1977); M.D., Ph.D. (Johns Hopkins 1985, 1985) [1996]

DAVID LEE CARLTON, Associate Professor of History
B.A. (Amherst 1970); M.A., M.Phil., Ph.D. (Yale 1974, 1974, 1977) [1983]

GRAHAM F. CARPENTER, Professor of Biochemistry; Professor of Medicine
B.S., M.S. (Rhode Island 1966, 1969); Ph.D. (Tennessee 1974) [1974]

LAURA M. CARPENTER, Associate Professor of Sociology
B.S., B.A. (Boston University 1991); M.A., Ph.D. (Pennsylvania 1995, 1999) [2002]

BRUCE D. CARTER, Professor of Biochemistry; Investigator, Center for Molecular Neuroscience; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Alma 1986); Ph.D. (Michigan 1992) [1997]

CLINT E. CARTER, Professor of Biological Sciences
B.A., M.A. (Loma Linda 1965, 1967); Ph.D. (California, Los Angeles 1971) [1973]

VIVIEN A. CASAGRANDE, Professor of Cell and Developmental Biology; Professor of Psychology, College of Arts and Science; Professor of Ophthalmology and Visual Sciences; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.A. (Colorado 1964); Ph.D. (Duke 1973) [1976]

KENNETH C. CATANIA, Associate Professor of Biological Sciences
B.S. (Maryland 1989); M.S., Ph.D. (California, San Diego 1992, 1994) [1997]

G. ROGER CHALKLEY, Senior Associate Dean, Biomedical Research, Education, and Training; Professor of Molecular Physiology and Biophysics; Professor of Medical Education and Administration
B.A., M.A., D.Phil. (Oxford 1961, 1962, 1964) [1986]

PAUL K. CHANEY, E. Bronson Ingram Professor of Accounting
B.S. (Indiana, Fort Wayne 1975); M.B.A., Ph.D. (Indiana 1977, 1983); C.P.A., C.M.A. [1983]

CHARLES RICHARD CHAPPELL, Research Professor of Physics; Director, Science and Research Communications; Executive Director, Dyer Observatory
B.A. (Vanderbilt 1965); Ph.D. (Rice 1968) [1997]

JAMES DAVID CHAPPELL, Assistant Professor of Pathology; Assistant Professor of Pediatrics
B.S., M.S. (Murray State 1988, 1991); Ph.D., M.D. (Vanderbilt 1997, 2001) [2005]

VERA A. STEVENS CHATMAN, Professor of the Practice of Human and Organizational Development
B.A., M.A. (Fisk 1970, 1972); Ph.D. (Vanderbilt 1976) [1994]

WALTER J. CHAZIN, Chancellor's Professor of Biochemistry and Physics; Professor of Biochemistry; Professor of Physics; Director, Center for Structural Biology
B.Sc. (McGill 1975); Ph.D. (Concordia 1983) [1999]

EDUARD Y. CHEKMENEV, Assistant Professor of Radiology and Radiological Sciences; Assistant Professor of Biochemistry
B.S. (Perm State [Russia] 1998); Ph.D. (Louisville 2003) [2009]

JIN CHEN, Associate Professor of Medicine; Associate Professor of Cell and Developmental Biology; Associate Professor of Cancer Biology
M.D. (Shanghai Medical [China] 1984); Ph.D. (Harvard 1991) [1997]

KONG Y. CHEN, Adjunct Assistant Professor of Medicine; Assistant Professor of Surgery
B.S. (Tennessee Technological 1993); Ph.D., M.S.C.I. (Vanderbilt 1997, 2002) [1997]

LI MIN CHEN, Assistant Professor of Radiology and Radiological Sciences
M.D., M.S., Ph.D. (Fourth Military Medical [China] 1989, 1992, 1997) [2006]

WENBIAO CHEN, Assistant Professor of Molecular Physiology and Biophysics
B.S. (Hunan Normal 1985); M.S. (Washington State 1993); Ph.D. (Oregon Health Sciences 1997) [2008]

ALAN D. CHERRINGTON, Jacquelyn A. Turner and Dorothy J. Turner Professor of Diabetes Research; Professor of Molecular Physiology and Biophysics; Professor of Medicine
B.Sc. (New Brunswick 1967); M.Sc., Ph.D. (Toronto 1969, 1972) [1974]

CHIN CHIANG, Professor of Cell and Developmental Biology; Member, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.S. (SUNY, Buffalo 1984); M.D., Ph.D. (Washington State 1986, 1990) [1997]

GIACOMO CHIOZZA, Assistant Professor of Political Science
Master (Centro Studi Politeia, Milano 1992); Laurea (Università degli Studi de Milano 1997); M.A., Ph.D. (Duke 2001, 2004) [2008]

SUN-JOO CHO, Assistant Professor of Psychology, Peabody College
B.A., B.A., M.A. (Yonsei [Korea] 1999, 2001, 2003); Ph.D. (Georgia 2007) [2009]

THOMAS L. CHRISTENBERY, Assistant Professor of Nursing
B.S.N. (Murray State 1976); M.S.N., Ph.D. (Vanderbilt 1987, 2004); R.N. [2001]

WILLIAM G. CHRISTIE, Frances Hampton Currey Professor of Management; Professor of Law
B.Com. hons. (Queen's [Ontario] 1978); M.B.A., Ph.D. (Chicago 1980, 1989) [1989]

CHANG YONG CHUNG, Assistant Professor of Pharmacology; Assistant Professor of Biological Sciences
B.S., M.S. (Seoul National [Korea] 1986, 1988); Ph.D. (Duke 1995) [2001]

CHRISTINE HWAYONG CHUNG, Assistant Professor of Medicine; Assistant Professor of Cancer Biology
B.S. (California, Berkeley 1991); M.S. (Johns Hopkins 1994); M.D. (Eastern Virginia 1998) [2003]

DAI H. CHUNG, John Moore and Janie Robinson Lee Professor of Pediatric Surgery; Professor of Cancer Biology; Professor of Pediatrics
B.A. (Texas, Austin 1984); M.D. (Texas, Galveston 1988) [2009]

LARRY R. CHURCHILL, Ann Geddes Stahlman Professor of Medical Ethics; Professor of Medicine; Professor of Religion; Director, Center for Biomedical Ethics and Society
B.A. (Rhodes 1967); M.Div., Ph.D. (Duke 1970, 1973) [2002]

DOUGLAS CLARK, Associate Professor of Science Education
N.A. (North Carolina 1989); M.A. (Stanford 1991); Ph.D. (California, Berkeley 2000) [2009]

JAMES H. CLARKE, Professor of the Practice of Civil and Environmental Engineering; Professor of Earth and Environmental Sciences
B.A. (Rockford 1967); Ph.D. (Johns Hopkins 1973) [1989]

LAUREN R. CLAY, Assistant Professor of History
B.A. (Princeton 1994); Ph.D. (Pennsylvania 2003) [2008]

ELLEN WRIGHT CLAYTON, Rosalind E. Franklin Professor of Genetics and Health Policy; Director, Health Policy Center; Professor of Pediatrics; Professor of Law; Co-Director, Center for Biomedical Ethics and Society; Member, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Duke 1974); M.S. (Stanford 1976); J.D. (Yale 1979); M.D. (Harvard 1985) [1988]

JAY CLAYTON, William R. Kenan Jr. Professor of English; Professor of English
B.A. (Yale 1974); Ph.D. (Virginia 1979) [1988]

DAVID E. CLIFFEL, Associate Professor of Chemistry
B.S./B.E.E. (Dayton 1992); Ph.D. (Texas 1998) [2000]

JOSHUA D. CLINTON, Associate Professor of Political Science
B.A. (Rochester 1996); M.A., M.S., Ph.D. (Stanford 2000, 2001, 2003) [2009]

CHARLES E. COBB, Research Associate Professor of Molecular Physiology and Biophysics; Associate Professor of Nursing
B.S., M.S. (Michigan Technological 1980, 1981); Ph.D. (Vanderbilt 1986) [1990]

PAUL A. COBB, Professor of Education; Endowed Chair in Teaching and Learning
B.Sc. (Bristol 1975); M.A., Ed.D. (Georgia 1980, 1983) [1992]

ROBERT J. COFFEY, JR., John B. Wallace Professor of Medicine; Professor of Cell and Developmental Biology; Ingram Professor of Cancer Research
A.B. (Princeton 1970); M.D. (Georgetown 1976) [1986]

CHERYL M. COFFIN, Ernest W. Goodpasture Professor of Pathology
A.B. (Bowdoin 1975); M.D. (Vermont 1980) [2008]

MARK A. COHEN, Justin Potter Distinguished Professor of American Competitive Business (Economics); Professor of Law
B.S.F.S. (Georgetown 1978); M.A., Ph.D. (Carnegie-Mellon 1983, 1985) [1986]

STANLEY COHEN, Distinguished Professor of Biochemistry, Emeritus
B.A. (Brooklyn College 1943); M.A. (Oberlin 1945); Ph.D. (Michigan 1948); D.Sc. (hon., Chicago 1985); D.Sc. (hon., City University of New York, Brooklyn College 1987); D.Sc. (hon., Oberlin 1989) [1959]

ROGER J. COLBRAN, Professor of Molecular Physiology and Biophysics; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.Sc. (Bristol 1982); Ph.D. (Newcastle upon Tyne 1985) [1986]

DAVID A. COLE, Patricia and Rodes Hart Professor; Professor of Psychology, Peabody College; Chair, Department of Psychology and Human Development; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.A. (St. Olaf 1976); M.A., Ph.D. (Houston 1980, 1983) [2001]

ROBERT D. COLLINS, Professor of Pathology
B.A., M.D. (Vanderbilt 1948, 1951) [1957]

WILLIAM J. COLLINS, Professor of Economics
B.A., M.A., Ph.D. (Harvard 1993, 1995, 1998) [1998]

BRUCE E. COMPAS, Patricia and Rodes Hart Professor of Psychology and Human Development; Professor of Psychology, Peabody College; Professor of Pediatrics; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.A., M.A., Ph.D. (California, Los Angeles 1973, 1975, 1980) [2002]

DONALD L. COMPTON, Associate Professor of Special Education; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Michigan 1983); M.S., Ph.D. (Northwestern 1986, 1993) [2000]

ROGER D. CONE, Professor of Molecular Physiology and Biophysics and Chair of the Department
B.A. (Princeton 1980); Ph.D. (Massachusetts Institute of Technology 1985) [2008]

BETH ANN CONKLIN, Associate Professor of Anthropology
A.B. (Colorado College 1976); Ph.D. (California, San Francisco 1980) [1991]

JOHN P. CONLEY, Professor of Economics
B.A. (Chicago 1984); M.A., Ph.D. (Rochester 1987, 1990) [2002]

PETER JEFFREY CONN, Professor of Pharmacology; Director, Program in Translational Neuropharmacology; Investigator, Center for Molecular Neuroscience
B.S. (Lee 1981); Ph.D. (Vanderbilt 1986) [2003]

ALAIN CONNES, Distinguished Professor of Mathematics
B.S., Ph.D. (École Normale Supérieure [Paris] 1970, 1973) [2003]

EDWARD GAGE CONTURE, Professor of Hearing and Speech Sciences; Director, Division of Graduate Studies; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Emerson 1967); M.S. (Northwestern 1968); Ph.D. (Iowa 1972) [1997]

COLLEEN CONWAY-WELCH, Nancy and Hilliard Travis Professor of Nursing; Dean of the School of Nursing; Professor of Nursing
B.S. (Georgetown 1965); M.S.N. (Catholic 1969); Ph.D. (New York 1973); R.N., C.N.M., F.A.A.N., F.A.C.N.M. [1984]

BRUCE COOIL, Dean Samuel B. and Evelyn R. Richmond Professor of Management (Statistics)
B.S., M.S. (Stanford 1975, 1976); Ph.D. (Pennsylvania 1982) [1982]

GEORGE E. COOK, Associate Dean for Research and Graduate Studies, School of Engineering; Professor of Electrical Engineering, Emeritus
B.E. (Vanderbilt 1960); M.S. (Tennessee 1961); Ph.D. (Vanderbilt 1965); P.E. [1963]

REBECCA S. COOK, Assistant Professor of Cancer Biology
B.S. (Vanderbilt 1993); Ph.D. (Cincinnati 1998) [2008]

THOMAS H. COOK, Assistant Professor of Nursing
B.S.N. (Loyola, Chicago 1968); M.S.N. (Saint Louis 1972); Ph.D. (Vanderbilt 1994); R.N. [1992]

MICHAEL KANE COOPER, Assistant Professor of Neurology; Member, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.S. (Rhodes 1987); M.D. (Alabama 1992) [2002]

JACKIE D. CORBIN, Professor of Molecular Physiology and Biophysics
B.S. (Tennessee Technological 1963); Ph.D. (Vanderbilt 1968) [1971]

DAVID S. CORDRAY, Professor of Public Policy; Professor of Psychology, Peabody College
B.A., M.A. (California State, Northridge 1972, 1974); Ph.D. (Claremont 1979) [1989]

PAMELA C. CORLEY, Assistant Professor of Political Science
B.S. (Georgia Institute of Technology 1989); J.D., M.A., Ph.D. (Georgia State 1995, 2003, 2005) [2005]

ANNE L. CORN, Professor of Special Education, Emerita
B.S. (Syracuse 1972); M.A. (California State, San Francisco 1973); Ed.M., Ed.D. (Columbia 1978, 1980) [1992]

DANIEL B. CORNFIELD, Professor of Sociology; Professor of Political Science
A.B., A.M., Ph.D. (Chicago 1974, 1977, 1980) [1980]

DAVID CORTEZ, Professor of Biochemistry; Ingram Professor of Cancer Research
B.S. (Illinois 1993); Ph.D. (Duke 1997) [2002]

TIMOTHY L. COVER, Professor of Medicine; Associate Professor of Microbiology and Immunology
B.S. (Muhlenberg 1980); M.D. (Duke 1984) [1990]

RONALD L. COWAN, Assistant Professor of Psychiatry; Assistant Professor of Radiology and Radiological Sciences; Member, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Christian Brothers 1984); Ph.D. (Tennessee 1990); M.D. (Cornell 1994) [2002]

DANA C. CRAWFORD, Assistant Professor of Molecular Physiology and Biophysics
B.S. (Vanderbilt 1995); Ph.D. (Emory 2000) [2006]

KATHERINE B. CRAWFORD, Professor of History
B.A. (Columbia College 1988); M.S., Ph.D. (Chicago 1991, 1997) [1999]

PHILIP S. CROOKE III, Professor of Mathematics; Professor of Education
B.S. (Stevens Institute of Technology 1966); Ph.D. (Cornell 1970) [1970]

JAMES E. CROWE, JR., Professor of Pediatrics; Ingram Professor of Cancer Research; Professor of Microbiology and Immunology
B.S. (Davidson 1983); M.D. (North Carolina 1987) [1995]

ROBERT L. CROWSON, JR., Professor of Education
A.B., M.A.T. (Oberlin 1961, 1962); Ph.D. (Chicago 1974) [1993]

MARIO CRUCINI, Associate Professor of Economics
B.A. (Western Ontario 1985); M.A., Ph.D. (Rochester 1989, 1991) [1999]

THOMAS A. CRUSE, H. Fort Flowers Professor of Mechanical Engineering, Emeritus
B.S., M.S. (Stanford 1963, 1964); Ph.D. (University of Washington 1967) [1990]

STEVEN E. CSORNA, Associate Professor of Physics
B.S. (New York 1968); M.A., Ph.D. (Columbia 1970, 1974) [1978]

YI CUI, Assistant Professor of Computer Science; Assistant Professor of Computer Engineering
B.S., M.S. (Tsinghua [China] 1997, 1999); Ph.D. (Illinois 2005) [2005]

PETER T. CUMMINGS, John R. Hall Professor of Chemical Engineering
B. Math. (Newcastle 1976); Ph.D. (Melbourne 1980) [2002]

JOSEPH J. CUNNINGHAM, Associate Professor of Special Education
B.S., M.S. (Syracuse 1963, 1965); Ed.D. (Illinois 1970) [1969]

KEVIN P. M. CURRIE, Assistant Professor of Anesthesiology; Assistant Professor of Pharmacology; Investigator, Center for Molecular Neuroscience
B.Sc. (Edinburgh 1990); Ph.D. (London 1994) [2002]

ANASTASIA C. CURWOOD, Assistant Professor of African American and Diaspora Studies; Assistant Professor of History
A.B. (Bryn Mawr 1996); M.A., Ph.D. (Princeton 1999, 2003) [2005]

LAURIE E. CUTTING, Patricia and Rodes Hart Associate Professor of Special Education; Associate Professor of Psychology, Peabody College; Associate Professor of Pediatrics; Associate Professor of Radiology and Radiological Sciences; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.A. (American University 1993); M.A., Ph.D. (Northwestern 1995, 1999) [2009]

KAREN D'APOLITO, Professor of Nursing; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.S.N. (Trenton State 1979); M.S.N. (Case Western Reserve 1981); Ph.D. (University of Washington 1994); R.N. [1998]

RICHARD T. D'AQUILA, Addison B. Scoville Professor of Medicine; Professor of Microbiology and Immunology; Director, Center for AIDS Research
B.A. (Yale 1975); M.D. (Albert Einstein 1979) [2001]

RICHARD L. DAFT, Brownlee O. Currey Jr. Professor of Management (Organization Studies)
B.S.B.A. (Nebraska 1967); M.B.A., Ph.D. (Chicago 1971, 1974) [1989]

ARTHUR FREDERICK DALLEY II, Professor of Cell and Developmental Biology; Professor of Orthopaedics and Rehabilitation
B.S., Ph.D. (Utah 1970, 1975) [1998]

BRIDGET MONROE DALTON, Assistant Professor of Language, Literacy, and Culture
B.A. (American 1974); M.S.Ed. (Old Dominion 1982); Ed.D. (Harvard 1991) [2007]

BRUCE M. DAMON, Assistant Professor of Radiology and Radiological Sciences; Assistant Professor of Molecular Physiology and Biophysics; Assistant Professor of Biomedical Engineering
B.S. (Massachusetts 1987); M.S., Ph.D. (Illinois 1993, 2000) [2002]

WILLIAM W. DAMON, Professor of Economics and Business Administration; Professor of Management; Director, Managerial Studies
B.S. (Purdue 1965); M.B.A., Ph.D. (Cornell 1967, 1970) [1976]

KATE DANIELS, Associate Professor of English
B.A., M.A. (Virginia 1975, 1977); M.F.A. (Columbia 1980) [1995]

PRAN KRISHNA DATTA, Associate Professor of Surgery; Associate Professor of Cancer Biology
B.Sc., M.Sc. (Burdwan [India] 1979, 1982); Ph.D. (Bose Institute [India] 1987) [2000]

ANDREW F. DAUGHETY, Professor of Economics; Professor of Law
B.S. (Case Institute of Technology 1969); M.S., Ph.D. (Case Western Reserve 1971, 1972); M.A. (Southern California 1975) [1995]

UTPAL P. DAVE, Assistant Professor of Medicine; Assistant Professor of Cancer Biology
B.S., M.D. (Northwestern 1990, 1994) [2005]

JEFFREY MARK DAVIDSON, Professor of Pathology
B.S. (Tufts 1967); M.S., Ph.D. (Stanford 1969, 1975) [1986]

JIMMY L. DAVIDSON, Professor of Electrical Engineering, Emeritus; Professor of Materials Science and Engineering, Emeritus; Professor of Engineering Management, Emeritus
B.A. (Hendrix 1962); M.S., Ph.D. (Columbia 1965, 1967) [1989]

SEAN S. DAVIES, Assistant Professor of Pharmacology
B.S., Ph.D. (Utah 1993, 1999) [2002]

DENISE D. DAVIS, Assistant Professor of Psychology, College of Arts and Science
B.S. (Florida State 1977); Ph.D. (South Carolina 1982) [1988]

VICTORIA J. DAVIS, Assistant Clinical Professor of Human and Organizational Development
B.A. (Illinois, Springfield 1988); M.Ed., Ed.D. (Vanderbilt 1993, 1999) [2001]

BENOIT M. DAWANT, Professor of Electrical Engineering; Professor of Computer Science; Professor of Radiology and Radiological Sciences
M.S. (Université catholique de Louvain 1982); Ph.D. (Houston 1987) [1988]

JOAN COLIN DAYAN, Robert Penn Warren Professor in the Humanities; Professor of English
B.A. (Smith 1971); Ph.D. (City University Graduate Center 1980) [2004]

MARK P. DE CAESTECKER, Associate Professor of Medicine; Assistant Professor of Cancer Biology; Associate Professor of Cell and Developmental Biology; Associate Professor of Surgery
B.A., M.A. (Cambridge 1980, 1980); M.B.B.S. (London 1983); Ph.D. (Manchester 1994) [2000]

MICHAEL DE RIESTHAL, Assistant Professor of Hearing and Speech Sciences; Assistant Professor of Neurology
B.S. (Northwestern 1997); M.S., Ph.D. (Vanderbilt 1999, 2003) [2007]

KENNETH A. DEBELAK, Associate Professor of Chemical and Biomolecular Engineering and Associate Chair of the Department
B.S. (Dayton 1969); M.S., Ph.D. (Kentucky 1973, 1977) [1977]

NATHALIE A. DEBRAUWERE-MILLER, Associate Professor of French
Ph.D. (Emory 2000) [2001]

PAUL J. DEHART, Associate Professor of Theology
A.B. (Chicago 1987); M.A.R. (Yale 1990); Ph.D. (Chicago 1997) [1997]

ERIC DELPIRE, Professor of Anesthesiology; Professor of Molecular Physiology and Biophysics; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.S., M.S., Ph.D. (Liège [Belgium] 1981, 1983, 1989) [1997]

ARTHUR A. DEMAREST, Ingram Professor of Anthropology
B.A. (Tulane 1974); A.M., Ph.D. (Harvard 1977, 1981) [1983]

MARK R. DENISON, Professor of Pediatrics; Professor of Microbiology and Immunology
B.S., M.D. (Kansas 1977, 1980) [1991]

JOSHUA C. DENNY, Assistant Professor of Clinical Biomedical Informatics; Assistant Professor of Medicine
B.S., M.D. (Vanderbilt 1998, 2003) [2006]

JEROD SCOTT DENTON, Assistant Professor of Anesthesiology; Assistant Professor of Pharmacology
B.S., M.S. (Central Arkansas 1995, 1997); Ph.D. (Dartmouth 2001) [2005]

TERENCE S. DERMODY, Professor of Pediatrics; Professor of Microbiology and Immunology
B.S. (Cornell 1978); M.D. (Columbia 1982) [1990]

LARISA GRAWE DESANTIS, Assistant Professor of Earth and Environmental Sciences
B.S. (California, Berkeley 2000); M.E.M. (Yale 2003) [2009]

WOLF-DIETRICH DETTBARN, Professor of Pharmacology, Emeritus
M.D. (Georg-August-Universität Göttingen 1953) [1968]

ARIEL Y. DEUTCH, Professor of Psychiatry; Professor of Pharmacology; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.A. (Vanderbilt 1973); Ph.D. (Georgia 1983) [1996]

CAROLYN DEVER, Dean, College of Arts and Science; Professor of English; Professor of Women's and Gender Studies
A.B. (Boston College 1988); A.M., Ph.D. (Harvard 1990, 1993) [1999]

PUNITA DHAWAN, Assistant Professor of Surgery; Assistant Professor of Cancer Biology
B.S. (Delhi [India] 1991); M.S. (India Institute 1993); Ph.D. (Arkansas 1999) [2002]

EMMANUELE DIBENEDETTO, Centennial Professor of Mathematics; Professor of Molecular Physiology and Biophysics
B.A. (Università di Firenze 1975); Ph.D. (Texas 1979) [2000]

DENNIS C. DICKERSON, James M. Lawson Jr. Professor of History; Professor of History
B.A. (Lincoln 1971); M.A., Ph.D. (Washington University 1974, 1978); M.Div. (Vanderbilt 2007) [1999]

JAMES H. DICKERSON II, Assistant Professor of Physics
B.A. (Amherst 1994); M.A., Ph.D. (SUNY, Stony Brook 1999, 2002) [2004]

DAVID K. DICKINSON, Professor of Education and Interim Chair of the Department of Teaching and Learning; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Oberlin 1971); Ed.M. (Temple 1976); Ed.D. (Harvard 1982) [2005]

WILLIAM W. DICKINSON, Assistant Professor of Hearing and Speech Sciences
B.A., M.A. (Michigan State 1990, 1991); Au.D. (Central Michigan 2004) [2004]

MARY S. DIETRICH, Research Associate Professor of Nursing; Research Associate Professor of Psychiatry; Research Associate Professor of Biostatistics; Member, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Bethel 1979); M.S. (Fort Hays State 1982); Ph.D. (Vanderbilt 1996) [2002]

TOM D. DILLEHAY, Distinguished Professor of Anthropology; Professor of Anthropology
B.A. (North Texas 1970); Ph.D. (Texas 1976) [2004]

ZHAOHUA DING, Assistant Professor of Radiology and Radiological Sciences; Assistant Professor of Electrical Engineering; Assistant Professor of Biomedical Engineering; Assistant Professor of Chemical and Physical Biology
B.E. (University of Electronic Science 1990); M.S., Ph.D. (Ohio State 1997, 1999) [2002]

IDIT DOBBS-WEINSTEIN, Associate Professor of Philosophy; Associate Professor of Jewish Studies
B.A., M.A. (York [Canada] 1981, 1982); M.A., Ph.D. (Toronto 1983, 1987) [1987]

MARK D. DOES, Associate Professor of Biomedical Engineering; Associate Professor of Radiology and Radiological Sciences
B.S., M.S., Ph.D. (Alberta 1991, 1993, 1997) [2002]

PAUL R. DOKECKI, Professor of Psychology, Peabody College; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Manhattan 1962); M.A., Ph.D. (Peabody 1963, 1968) [1970]

KATHARINE M. DONATO, Professor of Sociology and Chair of the Department; Professor of Political Science; Director, Center for Medicine, Health, and Society
B.S. (New York Institute of Technology 1978); M.S.W. (Wisconsin, Milwaukee 1981); M.A., Ph.D. (SUNY, Stony Brook 1984, 1988) [2006]

JEFFREY P. DOTSON, Assistant Professor of Marketing
B.S. (Southern Utah 2002); M.B.A., M.Stat. (Utah 2003, 2005); Ph.D. (Ohio State 2009) [2009]

BONNIE J. DOW, Associate Professor of Communication Studies and Chair of the Department
B.A. (Baylor 1985); M.A. (Kansas 1987); Ph.D. (Minnesota 1990) [2006]

LAWRENCE W. DOWDY, Professor of Computer Science; Professor of Computer Engineering
B.S. (Florida State 1974); A.M., Ph.D. (Duke 1976, 1977) [1981]

WILLIAM R. DOYLE, Assistant Professor of Higher Education
B.A. (Villanova 1996); Ph.D. (Stanford 2004) [2004]

ROBERT A. DRISKILL, Professor of Economics
B.S. (Michigan State 1973); Ph.D. (Johns Hopkins 1978) [1992]

WILLIAM D. DUPONT, Professor of Biostatistics; Professor of Preventive Medicine
B.Sc., M.Sc. (McGill 1969, 1971); Ph.D. (Johns Hopkins 1976) [1977]

ELISABETH MAY DYKENS, Professor of Psychology, Peabody College; Professor of Pediatrics; Professor of Psychiatry; Director, Vanderbilt Kennedy Center for Research on Human Development; Co-Director, Vanderbilt Kennedy Center for Excellence in Developmental Disabilities Education, Research, and Service
B.A. (Mt. Holyoke 1979); M.A., Ph.D. (Kansas 1983, 1985) [2003]

MARSHALL C. EAKIN, Professor of History
B.A., M.A. (Kansas 1975, 1977); Ph.D. (California, Los Angeles 1981) [1983]

TONY LEE EARLEY, Samuel Milton Fleming Professor of English; Professor of English
B.A. (Warren Wilson 1983); M.F.A. (Alabama 1992) [1997]

MARKUS EBERL, Assistant Professor of Anthropology
Master of Arts (Bonn [Germany] 1999); Ph.D. (Tulane 2007) [2009]

FORD F. EBNER, Professor of Psychology, College of Arts and Science; Professor of Cell and Developmental Biology; Member, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
D.V.M. (Washington State 1958); Ph.D. (Maryland 1965) [1991]

JON F. EDD, Assistant Professor of Mechanical Engineering
B.S. (Texas 2001); Ph.D. (California, Berkeley 2006) [2009]

PAUL H. EDELMAN, Professor of Mathematics; Professor of Law
B.A. (Swarthmore 1976); Ph.D. (Massachusetts Institute of Technology 1980) [2000]

BENJAMIN EDEN, Professor of Economics
B.S. (Hebrew [Israel] 1971); Ph.D. (Chicago 1975) [2002]

MARTIN EGLI, Professor of Biochemistry
B.S., M.S., Ph.D. (ETH-Zurich [Switzerland] 1984, 1988, 1988) [2000]

BRANDT F. EICHMAN, Associate Professor of Biological Sciences; Assistant Professor of Biochemistry
B.S. (Mississippi 1993); Ph.D. (Oregon State 2000) [2004]

JOSIANE EDWARD EID, Assistant Professor of Cancer Biology
B.S., M.D. (American University of Beirut 1979, 1983) [2002]

CHRISTINE MARIE EISCHEN, Associate Professor of Pathology; Associate Professor of Cancer Biology
B.S. (Creighton 1992); Ph.D. (Mayo Clinic College of Medicine 1997) [2006]

WA'EL EL-RIFAI, Professor of Surgery; Professor of Cancer Biology
M.D., M.Sc. (Ain Shams 1986, 1992); Ph.D. (Helsinki 1996) [2005]

FLORENT ELEFTERIOU, Assistant Professor of Medicine; Assistant Professor of Pharmacology
Ph.D. (Claude-Bernard [France] 1999) [2006]

KATE L. J. ELLACOTT, Assistant Professor of Molecular Physiology and Biophysics
B.Sc. (Edinburgh 1999); Ph.D. (Manchester 2002) [2008]

MARK N. ELLINGHAM, Professor of Mathematics
B.S., M.S. (Melbourne 1981, 1983); Ph.D. (Waterloo 1986) [1986]

STEPHEN N. ELLIOTT, Professor of Special Education; Dunn Family Chair in Educational and Psychological Assessment
B.S., M.A. (Michigan State 1974, 1976); M.A.Ed., Ph.D. (Arizona State 1977, 1980) [2004]

JAMES W. ELY, JR., Professor of Law, Emeritus; Milton R. Underwood Chair in Free Enterprise, Emeritus; Professor of History, Emeritus; Lecturer in Law
A.B. (Princeton 1959); LL.B. (Harvard 1962); M.A., Ph.D. (Virginia 1968, 1971) [1972]

RONALD B. EMESON, Joel G. Hardman Professor of Pharmacology; Professor of Molecular Physiology and Biophysics; Professor of Psychiatry; Investigator, Center for Molecular Neuroscience; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Johns Hopkins 1980); Ph.D. (Colorado 1986) [1991]

MIMI ENGEL, Assistant Professor of Public Policy and Education
B.A. (Illinois 1993); A.M. (Chicago 1998); Ph.D. (Northwestern 2008) [2009]

LYNN E. ENTERLINE, Chancellor's Professor of English; Professor of English
B.A. (Vanderbilt 1978); B.A. (Oxford 1981); M.A., Ph.D. (Cornell 1986, 1989) [1998]

JAMES A. EPSTEIN, Distinguished Professor of History
B.A. (Sussex 1970); Ph.D. (Birmingham [England] 1977) [1986]

DAVID J. ERNST, Professor of Physics
S.B., Ph.D. (Massachusetts Institute of Technology 1965, 1970) [1992]

JENNIFER E. ESCALAS, Associate Professor of Management
B.A., M.B.A. (California, Los Angeles 1985, 1991); Ph.D. (Duke 1996) [2004]

KEVIN C. ESS, Assistant Professor of Neurology; Assistant Professor of Pediatrics; Assistant Professor of Cell and Developmental Biology; Member, Vanderbilt Kennedy Center for Research on Human Development
B.M., Ph.D., M.D. (Cincinnati 1986, 1996, 1998) [2006]

LEA HELEN EVANS, Assistant Professor of Hearing and Speech Sciences
B.S. (Lambuth 1987); M.S. (Mississippi 1992); Ph.D. (Tennessee 1997) [2008]

JOHN H. EXTON, Professor of Molecular Physiology and Biophysics; Professor of Pharmacology; Investigator, Howard Hughes Medical Institute
B.Med.Sc., M.B.,Ch.B. (New Zealand 1955, 1958); Ph.D., M.D. (Otago 1963, 1984) [1964]

JANET S. EYLER, Professor of the Practice of Education
B.A., M.Ed. (University of Washington 1966, 1970); Ph.D. (Indiana 1977) [1981]

YANQIN FAN, Professor of Economics; Professor of Mathematics
B.Sc. (Jilin [China] 1985); M.A., Ph.D. (Western Ontario 1987, 1990) [2001]

ELLEN H. FANNING, Stevenson Professor of Biological Sciences
B.S. (Wisconsin 1968); Dr.rer.nat. (Cologne 1977) [1995]

DALE C. FARRAN, Professor of Education; Professor of Psychology, Peabody College; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A. (North Carolina 1965); Ph.D. (Bryn Mawr 1975) [1996]

SERGIO FAZIO, Professor of Medicine; Professor of Pathology
M.D. (Rome 1983); Ph.D. (Siena [Italy] 1989) [1993]

LEONARD C. FELDMAN, Stevenson Professor of Physics; Professor of Materials Science and Engineering
B.A. (Drew 1961); M.S., Ph.D. (Rutgers 1963, 1967) [1996]

STEPHEN W. FESIK, Professor of Biochemistry; Ingram Professor of Cancer Drug Discovery; Professor of Pharmacology
B.A. (Holy Cross 1975); Ph.D. (Connecticut 1981) [2009]

GERALD FIGAL, Associate Professor of East Asian Studies; Associate Professor of History
B.A. (California, Santa Barbara 1985); M.A., Ph.D. (Chicago 1987, 1992) [2003]

BARBARA MARY FINGLETON, Assistant Professor of Cancer Biology
B.Sc., Ph.D. (Dublin City University 1992, 1996) [2001]

MARY SUE FINO-SZUMSKI, Assistant Professor of Hearing and Speech Sciences
B.S. (Marywood 1986); M.S., Ph.D. (Vanderbilt 1987, 1997) [1997]

EDWARD F. FISCHER, Professor of Anthropology; Director, Center for Latin American Studies
B.A. (Alabama, Birmingham 1989); M.A., Ph.D. (Tulane 1995, 1995) [1996]

P. TOBI FISHEL, Assistant Professor of Psychiatry; Assistant Professor of Pediatrics
B.A. (SUNY, Binghamton 1984); Ph.D. (Miami [Florida] 1990) [1998]

DOUGLAS H. FISHER, Associate Professor of Computer Science; Associate Professor of Computer Engineering
B.S., M.S., Ph.D. (California, Irvine 1980, 1983, 1987) [1987]

EARL E. FITZ, Professor of Portuguese, Spanish, and Comparative Literature
B.A., M.A. (Iowa 1968, 1970); M.A. (CUNY, Queens 1973); Ph.D. (CUNY 1977) [1998]

J. MICHAEL FITZPATRICK, Professor of Computer Science; Professor of Computer Engineering; Professor of Radiology and Radiological Sciences; Professor of Neurological Surgery; Professor of Electrical Engineering
B.S. (North Carolina 1967); Ph.D. (Florida State 1972); M.S. (North Carolina 1982) [1982]

KATHLEEN FLAKE, Associate Professor of American Religious History
B.A. (Brigham Young 1974); J.D. (Utah 1980); M.A. (Catholic 1995); Ph.D. (Chicago 2000) [2000]

DANIEL M. FLEETWOOD, Olin H. Landreth Professor of Engineeering; Professor of Electrical Engineering and Chair of the Department of Electrical Engineering and Computer Science; Professor of Physics
B.S., M.S., Ph.D. (Purdue 1980, 1981, 1984) [1999]

STELLA M. FLORES, Assistant Professor of Public Policy and Higher Education; Assistant Professor of Human and Organizational Development; Assistant Professor of Sociology
B.A. (Rice 1996); M.P.Aff. (Texas 1998); Ed.M., Ph.D. (Harvard 2002, 2007) [2007]

STACEY M. FLOYD-THOMAS, Associate Professor of Ethics and Society
B.A. (Vassar 1991); M.T.S. (Candler School of Theology 1993); M.A., Ph.D. (Temple 1995, 1998) [2008]

SARAH C. FOGEL, Associate Professor of Nursing
B.M. (Boston University 1978); M.M. (Wayne State 1982); M.S.N., Ph.D. (Vanderbilt 1994, 2001); R.N. [1994]

AGNES B. FOGO, John L. Shapiro Professor of Pathology; Professor of Pediatrics; Professor of Medicine; Director, Division of Renal Pathology
B.A. (Tennessee, Chattanooga 1976); M.D. (Vanderbilt 1981) [1987]

LEONARD FOLGARAIT, Professor of History of Art
B.A., M.A., Ph.D. (California, Los Angeles 1972, 1975, 1980) [1981]

DONNA Y. FORD, Professor of Special Education
B.A., M.Ed., Ph.D. (Cleveland State 1984, 1988, 1991) [2004]

ANTHONY CARLYLE FORSTER, Assistant Professor of Pharmacology
B.Sc., Ph.D. (Adelaide [Australia] 1983, 1987); M.D. (Harvard 1996) [2005]

TERRAH L. FOSTER, Assistant Professor of Nursing
B.S. (Jacksonville State 1999); M.S.N., Ph.D. (Vanderbilt 2001, 2008); R.N. [2007]

WILLIAM R. FOWLER, JR., Associate Professor of Anthropology
B.A. (University of the Americas 1972); M.A., Ph.D. (Calgary 1977, 1982) [1987]

ROBERT FOX, Professor of Psychology, College of Arts and Science; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A., Ph.D. (Cincinnati 1957, 1963) [1963]

SHARRON H. FRANCIS, Research Professor of Molecular Physiology and Biophysics
B.S. (Western Kentucky 1965); Ph.D. (Vanderbilt 1970) [1976]

WILLIAM FRANKE, Professor of Comparative Literature and Italian
B.A. (Williams 1978); M.A. (Oxford 1980); M.A. (California, Berkeley 1988); Ph.D. (Stanford 1991) [1991]

JAMES C. FRASER, Associate Professor of Human and Organizational Development
B.A. (Georgia 1990); M.A., Ph.D. (Georgia State 1993, 1996) [2007]

MICHAEL L. FREEMAN, Professor of Radiation Oncology; Professor of Radiology and Radiological Sciences; Professor of Cancer Biology
B.S., Ph.D. (Colorado State 1974, 1978) [1983]

GINA L. FRIEDEN, Assistant Professor of the Practice of Human and Organizational Development
B.S. (Oklahoma 1978); M.D. (Indiana 1981); Ph.D. (Memphis State 1988) [1994]

EDWARD H. FRIEDMAN, Chancellor's Professor of Spanish; Professor of Spanish; Professor of European Studies; Professor of Comparative Literature; Director, Robert Penn Warren Center for the Humanities
B.A. (Virginia 1970); M.A., Ph.D. (Johns Hopkins 1971, 1974) [2000]

KATHERINE L. FRIEDMAN, Associate Professor of Biological Sciences
B.A. (Carleton 1990); Ph.D. (University of Washington 1996) [2001]

MARILYN A. FRIEDMAN, W. Alton Jones Professor of Philosophy; Professor of Philosophy
A.B. (Washington University 1967); Ph.D. (Western Ontario [Canada] 1974) [2009]

RAYMOND A. FRIEDMAN, Brownlee O. Currey Professor of Management (Organization Studies)
B.A. (Yale 1980); A.M., Ph.D. (Chicago 1983, 1987) [1994]

MARK E. FRISSE, Accenture Professor of Biomedical Informatics
B.S. (Notre Dame 1974); M.S. (Stanford 1978); M.D., M.B.A. (Washington University 1987, 1997) [2004]

LUKE M. FROEB, William and Margaret Oehmig Associate Professor of Free Enterprise and Entrepreneurship (Managerial Economics)
A.B. (Stanford 1978); Ph.D. (Wisconsin 1983) [1993]

MARC FROMENT-MEURICE, Professor of French
M.A. (Paris X 1975); Ph.D. (Paris VIII 1979); Doctorat d'Etat (Nice, Sophia-Antipolis 1992) [1996]

VIVIEN GREEN FRYD, Professor of History of Art and Chair of the Department; Professor of American Studies
B.A., M.A. (Ohio State 1974, 1977); Ph.D. (Wisconsin 1984) [1985]

DOUGLAS FUCHS, Professor of Special Education; Nicholas Hobbs Chair in Special Education and Human Development; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Johns Hopkins 1971); M.S. (Pennsylvania 1973); Ph.D. (Minnesota 1978) [1985]

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
B.A. (Johns Hopkins 1972); M.S. (Pennsylvania 1973); Ed.S., Ph.D. (Minnesota 1977, 1981) [1985]

DANIEL J. FUNK, Associate Professor of Biological Sciences
B.S. (Notre Dame 1989); Ph.D. (SUNY, Stony Brook 1996) [1999]

DAVID JON FURBISH, Professor of Earth and Environmental Sciences and Chair of the Department; Professor of Civil and Environmental Engineering
B.S. (North Carolina 1978); M.S. (California State 1981); Ph.D. (Colorado 1985) [2003]

DAVID H. FURSE, Adjunct Assistant Professor of Managerial Studies; Adjunct Professor of Management
A.B. (Georgia 1965); M.S (Illinois 1967); Ph.D. (Georgia State 1974) [2002]

MARCY SINGER GABELLA, Professor of the Practice of Education
A.B. (Harvard 1985); M.A. (Columbia 1987); Ph.D. (Stanford 1991) [2004]

KATHY L. GACA, Associate Professor of Classics; Associate Professor of Religion
B.A., M.A. (Illinois 1982, 1984); Ph.D. (Toronto 1996) [1997]

CYNTHIA S. GADD, Associate Professor of Biomedical Informatics
B.S. (North Carolina State 1976); M.B.A. (Winthrop 1979); Ph.D. (Pittsburgh 1995); M.S. (Duke 1998) [2005]

DAVID GAILANI, Professor of Pathology; Professor of Medicine
B.A. (Cornell 1980); M.D. (Illinois 1984) [1995]

MARTIN J. GALLAGHER, Assistant Professor of Neurology; Member, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Notre Dame 1989); M.D., Ph.D. (Washington University 1997, 1997) [2002]

AURELIO GALLI, Associate Professor of Molecular Physiology and Biophysics; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.A., Ph.D. (Milan [Italy] 1988, 1992) [2002]

KENNETH F. GALLOWAY, Dean of the School of Engineering; Professor of Electrical Engineering
B.A. (Vanderbilt 1962); Ph.D. (South Carolina 1966) [1996]

ROBERT L. GALLOWAY, JR., Professor of Biomedical Engineering; Professor of Surgery; Professor of Neurological Surgery
B.S.E. (Duke 1977); M.E. (Virginia 1979); Ph.D. (Duke 1983) [1987]

JOSHUA T. GAMSE, Assistant Professor of Biological Sciences; Assistant Professor of Cell and Developmental Biology; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Rice 1994); Ph.D. (Massachusetts Institute of Technology 2000) [2005]

MAUREEN ANNE GANNON, Associate Professor of Medicine; Associate Professor of Molecular Physiology and Biophysics; Associate Professor of Cell and Developmental Biology
B.S. (Molloy 1985); M.S. (Adelphi 1988); Ph.D. (Cornell 1995) [2001]

JUDY GARBER, Professor of Psychology, Peabody College; Professor of Psychiatry; Associate Professor of Psychology, College of Arts and Science; Senior Fellow, Institute for Public Policy Studies; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.A. (SUNY, Buffalo 1973); Ph.D. (Minnesota 1987) [1985]

HUMBERTO GARCIA, Assistant Professor of English
B.A. (Florida International 2001); M.A., Ph.D. (Illinois 2003, 2007) [2007]

TIMOTHY M. GARDNER, Associate Professor of Management (Organization Studies)
B.L.S. (Bowling Green 1990); M.L.H.R. (Ohio State 1996); Ph.D. (Cornell 2002) [2007]

ANDREW C. GARRABRANTS, Research Associate Professor of Civil and Environmental Engineering
B.S., M.S., Ph.D. (Rutgers 1994, 1998, 2001) [2002]

ISABEL GAUTHIER, Professor of Psychology, College of Arts and Science; Associate Professor of Radiology and Radiological Sciences; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Université du Québec à Montréal 1993); M.S., Ph.D. (Yale 1995, 1998) [1999]

VOLNEY P. GAY, Professor of Religious Studies; Professor of Psychiatry
B.A. (Reed 1970); M.A., Ph.D. (Chicago 1973, 1976) [1979]

CONSTANCE BUMGARNER GEE, Associate Professor of Public Policy and Education; Associate Professor of Human and Organizational Development
B.F.A. (East Carolina 1976); M.F.A. (Pratt Institute 1979); Ph.D. (Pennsylvania State 1993) [2000]

JOHN G. GEER, Distinguished Professor of Political Science; Professor of Political Science and Chair of the Department
B.A. (Franklin and Marshall 1980); M.A., Ph.D. (Princeton 1982, 1986) [1995]

JAY GELLER, Associate Professor of Modern Jewish Culture; Associate Professor of Jewish Studies
B.A. (Wesleyan 1975); A.M., Ph.D. (Duke 1980, 1985) [1994]

ALFRED L. GEORGE, JR., Grant W. Liddle Professor of Medicine; Professor of Pharmacology; Director, Division of Genetic Medicine; Director, Institute of Integrative Genomics; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.A. (Wooster 1978); M.D. (Rochester 1982) [1996]

GARY GERSTLE, James Stahlman Professor of History; Professor of History; Professor of Political Science
B.A. (Brown 1976); M.A., Ph.D. (Harvard 1978, 1982) [2006]

MALCOLM GETZ, Associate Professor of Economics; Assistant to the Dean, College of Arts and Science
B.A. (Williams 1967); Ph.D. (Yale 1973) [1973]

LESLEY GILL, Professor of Anthropology and Chair of the Department
B.A. (Macalester College 1977); M.A., M.Phil., Ph.D. (Columbia 1978, 1980, 1984) [2008]

JONATHAN M. GILLIGAN, Associate Professor of Earth and Environmental Sciences
B.A. (Swarthmore 1982); Ph.D. (Yale 1991) [1995]

TODD D. GIORGIO, Professor of Biomedical Engineering and Chair of the Department; Professor of Chemical and Biomolecular Engineering
B.S. (Lehigh 1982); Ph.D. (Rice 1986); P.E. [1987]

SAM B. GIRGUS, Professor of English
A.B. (Syracuse 1962); M.A. (Iowa 1963); Ph.D. (New Mexico 1972) [1990]

JONATHAN D. GITLIN, James C. Overall Professor of Pediatrics and Chair of the Department; Assistant Vice Chancellor for Maternal and Child Health Affairs; Physician in Chief, Monroe Carell Jr. Children's Hospital at Vanderbilt; Associate Dean for Clinical Affairs, School of Medicine; Professor of Cell and Developmental Biology; Member, Vanderbilt Kennedy Center for Research on Human Development
B.S., M.D. (Pittsburgh 1974, 1978) [2008]

DARIO A. GIUSE, Associate Professor of Biomedical Informatics
M.S., Ph.D. (Carnegie-Mellon 1993, 1979) [1999]

NUNZIA B. GIUSE, Professor of Biomedical Informatics; Director, Eskind Biomedical Library; Professor of Medicine
M.D. (Brescia [Italy] 1985); M.L.S. (Pittsburgh 1992) [1994]

SUZANNE GLOBETTI, Assistant Professor of Political Science
B.A. (Virginia 1991); Ph.D. (Texas 2002) [2004]

DANIEL FRANK GOCHBERG, Assistant Professor of Radiology and Radiological Sciences; Assistant Professor of Physics
B.S. (Massachusetts Institute of Technology 1991); M.S., Ph.D. (Yale 1994, 1998) [2002]

TERESA A. GODDU, Associate Professor of English; Director, American Studies Program
B.A. (Yale 1986); M.A., Ph.D. (Pennsylvania 1988, 1991) [1991]

ANIRUDDHA S. GOKHALE, Associate Professor of Computer Science; Associate Professor of Computer Engineering
B.E. (Poona 1989); M.S. (Arizona State 1992); D.Sc. (Washington University 1998) [2002]

JAMES RICHARD GOLDENRING, Paul W. Sanger Professor of Experimental Surgery; Professor of Surgery; Professor of Cell and Developmental Biology
A.B. (Harvard 1980); M.Phil., M.D. (Yale 1984, 1986) [2002]

MICHAEL GOLDFARB, H. Fort Flowers Professor of Mechanical Engineering
B.S. (Arizona 1988); S.M., Ph.D. (Massachusetts Institute of Technology 1992, 1994) [1994]

ELLEN B. GOLDRING, Patricia and Rodes Hart Chair; Professor of Educational Policy and Leadership and Chair of the Department of Leadership, Policy, and Organizations
B.S. (Wisconsin 1978); M.A. (Tel Aviv 1982); Ph.D. (Chicago 1985) [1991]

LEE ANN C. GOLPER, Professor of Hearing and Speech Sciences; Director, Division of Speech-Language Pathology
B.S. (Indiana 1971); M.S. (Portland State 1976); Ph.D. (Oregon 1982) [1999]

STEVEN L. GOODBRED, JR., Associate Professor of Earth and Environmental Sciences
B.A. (Boston University 1991); M.S. (South Florida 1994); Ph.D. (William and Mary 1999) [2005]

LENN E. GOODMAN, Andrew W. Mellon Professor of Humanities; Professor of Philosophy
A.B. (Harvard 1965); D.Phil. (Oxford 1968) [1994]

DAVID LEE GORDEN, Associate Professor of Surgery; Associate Professor of Cancer Biology
A.B. (Brown 1985); M.D. (Vanderbilt 1990) [2001]

JEFFRY S. GORDON, Professor of Educational Informatics of Nursing, Technology of Nursing; Assistant Professor of Biomedical Informatics
B.S. (Emory 1970); M.Ed., Ph.D. (Illinois 1972, 1976) [2002]

JOHN C. GORE, Hertha Ramsey Cress University Professor of Radiology and Radiological Sciences and Biomedical Engineering; Professor of Molecular Physiology and Biophysics; Professor of Physics; Director, Institute of Imaging Science; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.Sc. (Manchester 1972); Ph.D. (London 1976); B.A. (Ealing 1983) [2002]

ROY K. GOTTFRIED, Professor of English
B.A., M.A. (Brown 1970, 1970); Ph.D. (Yale 1976) [1975]

KATHLEEN L. GOULD, Professor of Cell and Developmental Biology; Investigator, Howard Hughes Institute
A.B. (California, Berkeley 1981); Ph.D. (California, San Diego 1987) [1991]

STEPHEN E. GRAHAM, Professor of Special Education; Currey Ingram Chair in Special Education; Member, Vanderbilt Kennedy Center for Research on Human Development (On leave spring 2011)
B.S., M.S. (Valdosta State 1972, 1975); Ed.D. (Kansas 1978) [2005]

TODD R. GRAHAM, Professor of Biological Sciences; Professor of Cell and Developmental Biology
B.S. (Maryville 1984); Ph.D. (Saint Louis 1988) [1992]

D. WESLEY GRANTHAM, Professor of Hearing and Speech Sciences; Director, Division of Research
Ph.D. (Indiana 1975) [1980]

SENTA VICTORIA GREENE, Professor of Physics; Executive Dean, College of Arts and Science
A.B. (Tennessee 1984); M.Phil., M.S., Ph.D. (Yale 1987, 1987, 1993) [1994]

WILLIAM M. GREGG, Assistant Professor of Biomedical Informatics; Assistant Professor of Medicine
B.E.E. (Georgia Institute of Technology 1991); M.D. (Miami [Florida] 1997) [2003]

THOMAS A. GREGOR, Professor of Anthropology
B.A. (Chicago 1962); Ph.D. (Columbia 1969) [1975]

BRIAN A. GRIFFITH, Assistant Clinical Professor of Human and Organizational Development; Director, Program in Human and Organizational Development
B.S. (Miami [Ohio] 1992); M.Div. (Columbia International 1994); Ph.D. (South Carolina 1998) [1998]

GUOQIANG GU, Associate Professor of Cell and Developmental Biology
B.S. (Ji Lin [China] 1988); M.S. (Chinese Academy of Science 1991); Ph.D. (Columbia 1998) [2002]

GUILHERME GUALDA, Assistant Professor of Earth and Environmental Sciences
B.Sc., M.Sc. (Universidade de São Paulo 1999, 2001); Ph.D. (Chicago 2007) [2007]

SCOTT A. GUELCHER, Assistant Professor of Chemical and Biomolecular Engineering
B.S. (Virginia Tech 1992); M.S. (Pittsburgh 1996); Ph.D. (Carnegie-Mellon 1999) [2005]

F. PETER GUENGERICH, Harry Pearson Broquist Professor of Biochemistry; Director, Center in Molecular Toxicology
B.S. (Illinois 1970); Ph.D. (Vanderbilt 1973) [1975]

LISA GUENTHER, Assistant Professor of Philosophy
B.A. (Bishop's 1994); Ph.D. (Toronto 2002) [2007]

BASAK Z. GÜREL, Assistant Professor of Mathematics
B.Sc., M.Sc. (Middle East Technical University [Turkey] 1998, 1999); Ph.D. (California, Santa Cruz 2003) [2008]

EUGENIA V. GUREVICH, Assistant Professor of Pharmacology
B.S., Ph.D. (Moscow State 1980, 1985) [2001]

VSEVOLOD V. GUREVICH, Professor of Pharmacology; Investigator, Center for Molecular Neuroscience
B.S., M.S. (Moscow State 1980); Ph.D. (Shemyakin Institute 1990) [2001]

VOLKER H. HAASE, Krick-Brooks Associate Professor of Medicine; Associate Professor of Cancer Biology; Associate Professor of Molecular Physiology and Biophysics
B.A. (Gymnasiale Oberstufenschule 1980); M.D. (Johann Wolfgang Goethe Universität 1990) [2008]

DAVID L. HACHEY, Professor of Pharmacology; Professor of Biochemistry
B.A. (Oakland 1967); Ph.D. (California, Santa Barbara 1972) [1998]

KARL E. HACKENBRACK, Associate Professor of Management; Co-Director, Law and Business Program
B.S. (Davis and Elkins 1979); M.B.A. (Shippensburg 1983); Ph.D. (Ohio State 1988) [2004]

TROY ALAN HACKETT, Associate Professor of Hearing and Speech Sciences; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.A., M.A. (Indiana 1987, 1989); Ph.D. (Vanderbilt 1996) [1999]

RICHARD F. HAGLUND, JR., Professor of Physics
B.A. (Wesleyan 1967); M.A. (SUNY, Stony Brook 1968); Ph.D. (North Carolina 1975) [1984]

BARBARA HAHN, Distinguished Professor of German; Professor of German
Staatsexamen für den Höheren Schuldienst (Marburg 1976); Dr.phil (Free University of Berlin 1989); Habilitation (Hamburg 1993) [2004]

MAUREEN KAY HAHN, Assistant Professor of Medicine; Assistant Professor of Pharmacology; Member, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.A. (Pennsylvania 1987); M.S. (Pittsburgh 1993); Ph.D. (Wayne State 1999) [2002]

JONATHAN LEE HAINES, T. H. Morgan Professor of Human Genetics; Professor of Molecular Physiology and Biophysics; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Director, Center for Human Genetics Research
B.A. (Colby 1979); Ph.D. (Minnesota 1984) [1997]

SUE T. HALE, Assistant Professor of Hearing and Speech Sciences
B.A.E., M.C.D. (Mississippi 1972, 1975) [2000]

LEOR HALEVI, Associate Professor of History
B.A. (Princeton 1994); M.A. (Yale 1996); Ph.D. (Harvard 2002) [2008]

DENNIS G. HALL, Vice Provost for Research; Dean of the Graduate School; Professor of Physics; Professor of Electrical Engineering
B.S. (Illinois 1970); M.S. (Southern Illinois 1972); Ph.D. (Tennessee 1976) [2000]

ROGERS P. HALL, Professor of Mathematics Education
B.A., M.A. (Houston 1976, 1978); M.S., Ph.D. (California, Irvine 1983, 1990) [2002]

JOSEPH H. HAMILTON, Landon C. Garland Distinguished Professor of Physics; Director, Joint Institute for Heavy Ion Research
B.S. (Mississippi College 1954); M.S., Ph.D. (Indiana 1956, 1958); D.Sc. (hon., Mississippi College 1982); Dr.Phil.Nat.Hon.Causa (hon., Johann Wolfgang Goethe Universität 1992); Dr.Phil.Nat.Hon.Causa (Bucharest [Romania] 1999); Dr.Phil.Nat.Hon.Causa (St. Petersburg State 2001) [1958]

HEIDI ELIZABETH HAMM, Earl W. Sutherland Jr. Professor of Pharmacology and Chair of the Department; Professor of Ophthalmology and Visual Sciences; Professor of Orthopaedics and Rehabilitation; Investigator, Center for Molecular Neuroscience
B.A. (Atlantic Union 1973); Ph.D. (Texas 1980) [2000]

M. DONALD HANCOCK, Professor of Political Science, Emeritus
B.A. (Texas 1961); M.A., Ph.D. (Columbia 1962, 1966) [1979]

STEVEN K. HANKS, Professor of Cell and Developmental Biology; Associate Professor of Medicine
B.S. (Utah 1977); Ph.D. (Texas Health Science Center, Houston 1982) [1990]

STEPHEN R. HANN, Professor of Cell and Developmental Biology
A.B. (California, Berkeley 1974); Ph.D. (California, Riverside 1981) [1986]

TIMOTHY P. HANUSA, Professor of Chemistry
A.B. (Cornell College 1978); Ph.D. (Indiana 1983) [1985]

DOUGLAS P. HARDIN, Professor of Mathematics; Professor of Biomedical Informatics
B.E.E. (Georgia Institute of Technology 1980); M.E.E. (Stanford 1982); Ph.D. (Georgia Institute of Technology 1985) [1986]

FRANK E. HARRELL, JR., Professor of Biostatistics and Chair of the Department; Member, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Alabama 1973); Ph.D. (North Carolina 1979) [2003]

JOEL F. HARRINGTON, Professor of History; Associate Provost for Global Strategy
B.A. (Notre Dame 1981); M.A., Ph.D. (Michigan 1983, 1989) [1989]

KAREN R. HARRIS, Professor of Special Education; Currey Ingram Chair in Special Education; Member, Vanderbilt Kennedy Center for Research on Human Development (On leave spring 2011)
B.A. (Northern Colorado 1974); M.A. (Nebraska 1978); Ed.D. (Auburn 1981) [2005]

PAUL A. HARRIS, Research Associate Professor of Biomedical Informatics; Research Associate Professor of Biomedical Engineering
B.S. (Tennessee Technological 1987); M.S., Ph.D. (Vanderbilt 1993, 1996) [1999]

RAYMOND C. HARRIS, JR., Ann and Roscoe R. Robinson Professor of Nephrology; Professor of Medicine; Director, George O'Brien Center for the Study of Renal Disease; Professor of Molecular Physiology and Biophysics; Director, Division of Nephrology
B.S. (Yale 1974); M.D. (Emory 1978) [1986]

THOMAS R. HARRIS, Orrin Henry Ingram Distinguished Professor of Engineering, Emeritus; Professor of Biomedical Engineering, Emeritus; Research Professor of Biomedical Engineering; Professor of Chemical Engineering, Emeritus; Professor of Medicine, Emeritus
B.S., M.S. (Texas A & M 1958, 1962); Ph.D. (Tulane 1964); M.D. (Vanderbilt 1974) [1964]

VICKI S. HARRIS, Assistant Clinical Professor of Psychology, Peabody College; Assistant Clinical Professor of Psychiatry; Member, Vanderbilt Kennedy Center for Research on Human Development; Fellow, Institute for Public Policy Studies
B.S. (SUNY, Cortland 1984); M.S., Ph.D. (Pennsylvania State 1987, 1991) [1993]

EVA MARIE HARTH, Assistant Professor of Chemistry; Assistant Professor of Pharmacology
B.S. (Friedrich-Wilhelms-Universität [Bonn] 1990); B.S., M.S. (Zurich 1994); Ph.D. (Mainz [Germany] 1998) [2004]

FREDERICK R. HASELTON, Professor of Biomedical Engineering; Professor of Ophthalmology and Visual Sciences
A.B. (Haverford 1969); Ph.D. (Pennsylvania 1981) [1989]

ALYSSA H. HASTY, Associate Professor of Molecular Physiology and Biophysics
B.S. (Tennessee Technological 1994); Ph.D. (Vanderbilt 1998) [2001]

DEBORAH D. HATTON, Associate Professor of Special Education
B.S. (Auburn 1974); M.S. (Florida State 1980); Ph.D. (North Carolina 1995) [2009]

ANTONIS K. HATZOPOULOS, Associate Professor of Medicine; Associate Professor of Cell and Developmental Biology
B.S. (Aristotelion [Greece] 1981); Ph.D. (Northwestern 1986) [2005]

JACEK HAWIGER, Oswald T. Avery Distinguished Professor of Microbiology and Immunology and Chair of the Department
M.D. (Copernicus School of Medicine 1962); Ph.D. (National Institute of Hygiene [Warsaw] 1967); M.A. (hon., Harvard 1987); M.D. (hon., Copernicus School of Medicine 1992) [1990]

P. LYNN HAYES, Associate Professor of Hearing and Speech Sciences
B.A. (Lenoir-Rhyne College 1980); M.S. (Wisconsin, Milwaukee 1985); Ph.D. (Pittsburgh 1991) [2007]

SIMON WILLIAM HAYWARD, Associate Professor of Urologic Surgery; Associate Professor of Cancer Biology
B.Sc., M.Sc., Ph.D. (London 1981, 1984, 1991) [2001]

DAVID R. HEAD, Professor of Pathology and Vice Chair for Clinical Affairs
B.A. (Rice 1964); M.D. (Texas 1968) [2000]

CRAIG ANNE HEFLINGER, Associate Dean for Graduate Education, Peabody College; Professor of Human and Organizational Development; Senior Fellow, Institute for Public Policy Studies; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Vanderbilt 1973); M.A. (Peabody 1975); Ph.D. (Vanderbilt 1989) [1989]

MARY LOUISE HEMMETER, Associate Professor of Special Education; Member, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Auburn 1984); M.Ed., Ph.D. (Vanderbilt 1987, 1991) [2005]

MELISSA HENRY, Assistant Professor of Hearing and Speech Sciences
B.A. (Western Michigan 1980); M.A. (Wayne State 1982) [2008]

DAVID M. HERCULES, Centennial Professor of Chemistry, Emeritus; Research Professor of Chemistry
B.S. (Juniata 1954); Ph.D. (Massachusetts Institute of Technology 1957) [1994]

JONI HERSCH, Professor of Law and Economics
B.A. (South Florida 1977); Ph.D. (Northwestern 1981) [2006]

B. ANDES HESS, JR., Professor of Chemistry
B.A. (Williams 1962); M.S., Ph.D. (Yale 1963, 1966) [1968]

MARC J. HETHERINGTON, Professor of Political Science
B.A. (Pittsburgh 1990); Ph.D. (Texas 1997) [2004]

STEPHEN P. HEYNEMAN, Professor of International Educational Policy
B.A. (California, Berkeley 1964); M.A. (California, Los Angeles 1965); M.A., Ph.D. (Chicago 1973, 1975) [2000]

GERALD B. HICKSON, Joseph C. Ross Professor of Medical Education and Administration; Professor of Pediatrics; Associate Dean for Clinical Affairs and Director of the Vanderbilt Center for Patient and Professional Advocacy; Clinical Associate Professor of Nursing; Associate Professor of Hearing and Speech Sciences; Professor of Psychiatry
B.S. (Georgia 1973); M.D. (Tulane 1978) [1982]

SCOTT W. HIEBERT, Professor of Biochemistry; Associate Professor of Medicine
B.S. (Bethel 1982); Ph.D. (Northwestern 1987) [1997]

MICHAEL S. HIGGINS, Professor of Anesthesiology and Chair of the Department; Associate Professor of Biomedical Informatics; Associate Professor of Surgery
B.S. (Lewis and Clark 1984); M.D., M.P.H. (Vanderbilt 1989, 1998) [1994]

GEORGE C. HILL, Levi Watkins Jr. Professor and Associate Dean for Diversity in Medical Education, School of Medicine; Professor of Medical Education and Administration; Professor of Microbiology and Immunology
B.A. (Rutgers 1961); M.S. (Howard 1963); Ph.D. (New York 1967) [2002]

JULIÁN FEDERICO HILLYER, Assistant Professor of Biological Sciences
B.A. (Chicago 1996); M.S., Ph.D. (Wisconsin 1999, 2004) [2007]
JONATHAN T. HISKEY, Associate Professor of Political Science
B.A. (North Carolina 1989); M.A. (Florida International 1993); M.A., Ph.D. (Pittsburgh 1995, 1999) [2005]
ANTHONY B. HMELO, Research Associate Professor of Physics; Research Associate Professor of Materials Science and Engineering
B.E., B.S., M.S., Ph.D. (SUNY, Stony Brook 1982, 1982, 1982, 1987) [1988]
ROBERT HODAPP, Professor of Special Education; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Columbia 1977); M.A., Ph.D. (Boston University 1981, 1983) [2003]
MICHAEL P. HODGES, Professor of Philosophy
B.A. (William and Mary 1963); M.A., Ph.D. (Virginia 1966, 1967) [1970]
STEVE HOEFFLER, Associate Professor of Management (Marketing)
B.A. (San Diego State 1985); M.B.A. (California, Davis 1994); Ph.D. (Duke 2000) [2006]
CLIFFORD A. HOFWOLT, Associate Professor of Science Education
B.A., M.A. (Colorado State College 1964, 1968); Ed.D. (Northern Colorado 1971) [1972]
JAMES H. HOGGE, Associate Dean for Faculty and Programs, Peabody College; Professor of Psychology, Emeritus, Peabody College
B.A., Ph.D. (Texas 1964, 1966) [1967]
KELLY HOLLEY-BOCKELMANN, Assistant Professor of Physics and Astronomy
B.S. (Montana State 1993); M.S., Ph.D. (Michigan 1995, 1999) [2007]
STEVEN D. HOLLON, Professor of Psychology, College of Arts and Science; Professor of Psychology, Peabody College; Professor of Psychiatry; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.A. (George Washington 1971); M.S., Ph.D. (Florida State 1974, 1977) [1985]
W. TIMOTHY HOLMAN, Research Associate Professor of Electrical Engineering
B.S. (Tennessee 1986); M.S., Ph.D. (Georgia Institute of Technology 1988, 1994) [2000]
CHARLES C. HONG, Assistant Professor of Medicine; Assistant Professor of Pharmacology
S.B. (Massachusetts Institute of Technology 1988); M.D., M.Phil., Ph.D. (Yale 1998, 1998, 1998) [2006]
LINDA JEAN HOOD, Professor of Hearing and Speech Sciences; Member, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Bowling Green State 1969); M.A. (Kent State 1974); Ph.D. (Maryland 1983) [2004]
WILLIAM J. HOOK, Professor of the Practice of Theological Librarianship; Director, Divinity Library; Assistant Dean for Collections, Heard Library
B.Sc. (Florida Institute of Technology 1974); M.Div. (Emory 1977); M.A., Ph.D. (Vanderbilt 1985, 1992) [1983]
RICHARD L. HOOVER, Professor of Pathology; Associate Professor of Pediatrics; Associate Dean of the Graduate School
B.A. (Ohio State 1966); M.S. (Kentucky 1969); Ph.D. (Michigan State 1972) [1985]
KATHLEEN V. HOOVER-DEMPSEY, Associate Professor of Psychology, Peabody College; Associate Professor of Education (On leave fall 2010)
A.B. (California, Berkeley 1964); M.A., Ph.D. (Michigan State 1969, 1974) [1973]
ILANA HORN, Associate Professor of Mathematics Education
B.A. (Swarthmore 1993); M.A., Ph.D. (California, Berkeley 1998, 2002) [2009]
GEORGE M. HORNBERGER, Distinguished University Professor; Craig E. Philip Professor of Engineering; Professor of Civil and Environmental Engineering; Professor of Earth and Environmental Sciences; Director, Vanderbilt Institute for Energy and Environment
B.S.C.E., M.S.C.E. (Drexel 1965, 1967); Ph.D. (Stanford 1970) [2008]
BENJAMIN W. Y. HORNSBY, Assistant Professor of Hearing and Speech Sciences; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Maryville College 1985); M.S., Ph.D. (Vanderbilt 1995, 2001) [2001]
GREGG M. HOROWITZ, Associate Professor of Philosophy; Associate Professor of Art
B.A. (Sarah Lawrence 1980); A.M. (Boston University 1983); Ph.D. (Rutgers 1992) [1993]
MARK HOSFORD, Associate Professor of Art
B.F.A. (Kansas 1998); M.F.A. (Tennessee 2001) [2001]
KEVIN X. D. HUANG, Associate Professor of Economics
Ph.D. (Minnesota 1998) [2006]
JAMES HUDNUT-BEUMLER, Dean of the Divinity School; Anne Potter Wilson Distinguished Professor of American Religious History
B.A. (Wooster 1980); M.Div. (Union Theological Seminary 1983); M.A., Ph.D. (Princeton 1989, 1989) [2000]
BILLY GERALD HUDSON, Elliot V. Newman Professor of Medicine; Professor of Biochemistry; Professor of Pathology; Director, Matrix Biology Center
B.S. (Henderson State Teachers 1962); M.S. (Tennessee 1963); Ph.D. (Iowa 1966) [2002]
PETER J. HUDSON, Assistant Professor of History
Bachelor of General Studies (Simon Fraser, British Columbia [Canada] 1995); Ph.D. (New York 2007) [2009]
GREGORY W. HUFFMAN, Professor of Economics
Bachelor of Commerce (Saskatchewan 1979); Ph.D. (Minnesota 1983) [2001]
C. BRUCE HUGHES, Professor of Mathematics
A.B. (Guilford 1976); M.A., Ph.D. (Kentucky 1979, 1981) [1985]
CAROLYN HUGHES, Professor of Special Education; Member, Vanderbilt Kennedy Center for Research on Human Development
A.B. (California, Berkeley 1969); M.S. (Eastern Montana 1985); Ph.D. (Illinois 1990) [1991]
STACEY S. HUPPERT, Assistant Professor of Cell and Developmental Biology
B.S. (Purdue 1992); Ph.D. (Indiana 1998) [2005]
M. SHANE HUTSON, Associate Professor of Physics; Assistant Professor of Biological Sciences
B.A., M.S. (Wake Forest 1992, 1993); Ph.D. (Virginia 2000) [2003]
NANCY LEA HYER, Associate Professor of Management (Operations)
B.A. (Richmond 1977); M.B.A., Ph.D. (Indiana 1981, 1982) [1992]
DAWN IACOBUCCI, E. Bronson Ingram Professor of Marketing; Associate Dean for Faculty Development
B.S., M.A., M.S., Ph.D. (Illinois 1982, 1985, 1985, 1987); M.T.S. (Garrett Evangelical Theological Seminary 1999) [2007]
YOSHIKUNI IGARASHI, Associate Professor of History
B.A. (International Christian University [Tokyo] 1985); M.A. (California, Berkeley 1989); Ph.D. (Chicago 1993) [1993]
SARAH IGO, Associate Professor of History; Associate Professor of Political Science
A.B. (Harvard 1992); M.A., Ph.D. (Princeton 1997, 2001) [2008]
TADASHI INAGAMI, Stanford Moore Professor of Biochemistry; Professor of Medicine; Director, Specialized Center of Research in Hypertension
B.S. (Kyoto 1953); M.S., Ph.D. (Yale 1955, 1958); D.Sc. (Kyoto 1963) [1966]
ROBERT B. INNES, Associate Professor of Psychology, Peabody College
B.A., M.A. (Michigan State 1963, 1965); Ph.D. (Michigan 1971) [1971
LARRY W. ISAAC, Distinguished Professor of Sociology; Professor of Sociology
B.S., M.A. (Akron 1971, 1974); Ph.D. (Indiana 1979) [2004]
LINDA N. ISAACS, Lecturer in Human and Organizational Development
J.D. (Nashville School of Law 1984); M.Ed., Ed.D. (Vanderbilt 1996, 2003) [2003]
TINA M. IVERSON, Assistant Professor of Pharmacology; Assistant Professor of Biochemistry
B.S. (St. John's 1995); Ph.D. (California Institute of Technology 2000) [2005]
GARY P. JACOBSON, Professor of Hearing and Speech Sciences; Director, Division of Audiology
B.A. (California State 1974); M.S. (Wisconsin 1975); Ph.D. (Kent State 1978) [2002]
CHRISTOPHER J. JANETOPOULOS, Assistant Professor of Cell and Developmental Biology; Assistant Professor of Cell and Developmental Biology
B.A. (Augustana 1990); Ph.D. (Texas A & M 1999) [2005]

E. DUCO JANSEN, Professor of Biomedical Engineering; Professor of Neurological Surgery
Drs. (M.Sc.) (Utrecht 1990); M.S., Ph.D. (Texas 1992, 1994) [1997]

JOHN WAYNE JANUSEK, Associate Professor of Anthropology
B.A., M.A. (Illinois, Chicago 1986, 1987); Ph.D. (Chicago 1994) [1998]

MARK JARMAN, Centennial Professor of English; Professor of English; Director, Creative Writing Program
A.B. (California, Santa Cruz 1974); M.F.A. (Iowa 1976) [1983]

CARLOS JÁUREGUI, Associate Professor of Spanish
Licenciado en Leyes (Universidad Externado de Colombia 1993); M.A. (West Virginia 1997); Ph.D. (Pittsburgh 2001) [2001]

ELIZABETH JELINEK, Assistant Professor of Philosophy; Assistant Professor of Classics
B.A. (Wellesley 2001); Ph.D. (Duke 2008) [2007]

NICOLE THORNE JENKINS, Associate Professor of Management (Accounting)
B.S. (Drexel 1992); 2002 (Iowa Ph.D.); C.P.A. [2007]

G. KANE JENNINGS, Associate Professor of Chemical and Biomolecular Engineering
B.S. (Auburn 1993); M.S., Ph.D. (Massachusetts Institute of Technology 1996, 1998) [1998]

GARY F. JENSEN, Professor of Sociology; Professor of Religious Studies
B.S. (Portland State 1966); M.A., Ph.D. (University of Washington 1968, 1972) [1989]

ROBIN M. JENSEN, Luce Chancellor's Professor of the History of Christian Worship and Art; Professor of History of Art
B.A. (Concordia 1973); M.A., M.Phil., Ph.D. (Union Theological Seminary [New York] 1977, 1986, 1991) [2003]

WALTER GRAY JEROME III, Associate Professor of Pathology; Associate Professor of Cancer Biology
B.A. (St. Andrews 1971); Ph.D. (Virginia 1981) [2001]

JASON R. JESSEN, Assistant Professor of Medicine; Assistant Professor of Cancer Biology
B.A. (Augustana 1992); M.S. (South Dakota State 1995); Ph.D. (Medical College of Georgia 1999) [2006]

DEBRA C. JETER, Associate Professor of Management (Accounting)
B.S., M.B.A. (Murray State 1975, 1981); Ph.D. (Vanderbilt 1990); C.P.A. [1994]

ROBERT JIMENEZ, Professor of Language, Literacy, and Culture (On leave spring 2011)
B.A. (University of the Americas [Mexico] 1978); M.Ed., Ph.D. (Illinois 1986, 1992) [2004]

JIM N. JIRJIS, Assistant Professor of Medicine; Assistant Professor of Biomedical Informatics
B.S. (Illinois 1989); M.D. (Chicago 1993) [1999]

CHRISTOPHER M. S. JOHNS, Norman L. and Roselea J. Goldberg Professor of History of Art; Professor of History of Art
B.A. (Florida State 1977); M.A., Ph.D. (Delaware 1980, 1985) [2003]

WILL E. JOHNS, Associate Professor of Physics
B.S. (Illinois 1987); Ph.D. (Colorado 1995) [1999]

CARL H. JOHNSON, Professor of Biological Sciences; Professor of Molecular Physiology and Biophysics; Member, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.A. (Texas 1976); Ph.D. (Stanford 1982) [1987]

DALE A. JOHNSON, Drucilla Moore Buffington Professor of Church History, Emeritus
B.A. (Colgate 1957); B.A. (Oxford 1959); B.D. (Lutheran School of Theology at Chicago 1962); M.A. (Oxford 1963); Th.D. (Union Theological Seminary [New York] 1967) [1969]

KEVIN B. JOHNSON, Professor of Biomedical Informatics and Vice Chair of the Department; Professor of Pediatrics
B.S. (Dickinson 1983); M.D. (Johns Hopkins 1987); M.S. (Stanford 1992) [2002]

MICHAEL JOHNSON, Assistant Professor of Classics
B.A. (Truman State 1998); M.A. (North Carolina 2002); Ph.D. (Rutgers 2007) [2009]

ROLANDA L. JOHNSON, Associate Professor of Nursing
B.S.N. (Tuskegee Institute 1985); M.S.N. (Troy State 1989); Ph.D. (Vanderbilt 1998); R.N. [1998]

JEFFREY N. JOHNSTON, Professor of Chemistry
B.S. (Xavier 1992); Ph.D. (Ohio State 1997) [2006]

OWEN D. JONES, Professor of Law; Professor of Biological Sciences
B.A. (Amherst 1985); J.D. (Yale 1991) [2003]

SEBASTIAN JOYCE, Professor of Microbiology and Immunology
B.Sc. (Bangalore [India] 1971); M.Sc. (Saurashtra [India] 1981); Ph.D. (Medical College of Virginia 1988) [1999]

CATHY LOGIN JRADE, Chancellor's Professor of Spanish; Professor of Spanish and Chair of the Department of Spanish and Portuguese
B.A. (City University of New York, Queens 1969); A.M., Ph.D. (Brown 1971, 1974) [1987]

JON H. KAAS, Distinguished Professor of Psychology, College of Arts and Science; Professor of Cell and Developmental Biology; Professor of Radiology and Radiological Sciences; Member, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.A. (Northland 1959); Ph.D. (Duke 1965) [1972]

ANN P. KAISER, Professor of Special Education; Susan Gray Chair in Education and Human Development; Professor of Psychology, Peabody College; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Kansas State 1970); M.A., Ph.D. (Kansas 1973, 1974) [1982]

SPYROS A. KALAMS, Associate Professor of Medicine; Associate Professor of Microbiology and Immunology
B.A. (Harvard 1983); M.D. (Connecticut 1987) [2002]

CINDY D. KAM, Associate Professor of Political Science
A.B. (Princeton 1996); M.A., Ph.D. (Michigan 2000, 2003) [2008]

WENG POO KANG, Professor of Electrical Engineering; Professor of Computer Engineering; Professor of Materials Science and Engineering
B.S. (Texas 1981); M.S., Ph.D. (Rutgers 1983, 1988) [1988]

DANIEL L. KAPLAN, Assistant Professor of Biological Sciences
B.A. (Virginia 1998); Ph.D. (Yale 2000) [2005]

CHRISTINA KARAGEORGOU-BASTEA, Associate Professor of Spanish
B.A. (Athens 1988); M.A. (Universidad Veracruzana 1994); M.A., Ph.D. (El Colegio de México 1996, 1998) [2002]

SHARON M. KARP, Assistant Professor of Nursing
B.S.N. (Xavier 1998); M.S.N., Ph.D. (Vanderbilt 1999, 2008); R.N., P.N.P. [2005]

GÁBOR KARSAI, Professor of Electrical Engineering; Professor of Computer Engineering; Professor of Computer Science
B.E.E., M.E.E., University Doctorate (Technical University of Budapest 1982, 1984, 1988); Ph.D. (Vanderbilt 1988) [1990]

GENNADI KASPAROV, Stevenson Professor of Mathematics, Professor of Mathematics
Ph.D. (Moscow State 1974); Doctor of Physics and Mathematics Sciences (Academy of Sciences [Kiev] 1984) [2002]

PIOTR KASZYNSKI, Associate Professor of Chemistry
M.Sc. (Technical University of Warsaw 1985); Ph.D. (Texas 1991) [1993]

IRINA N. KAVERINA, Assistant Professor of Cell and Developmental Biology
M.S. (Moscow Lomonosov State 1989); Ph.D. (Academy of Medical Sciences 1992) [2005]

KAZUHIKO KAWAMURA, Professor of Electrical Engineering; Professor of Computer Engineering; Professor of Engineering Management; Director, Center for Intelligent Systems
B.E. (Waseda 1963); M.S. (California, Berkeley 1966); Ph.D. (Michigan 1972) [1981]

TRICA D. KEATON, Associate Professor of African American and Diaspora Studies
B.A., M.A. (California, Los Angeles 1986, 1992); M.A. (Middlebury College 1991); Diplôme d'études approfondies (Université René Descartes, Paris V 1996); Ph.D. (California, Berkeley 2001) [2009]

ELLEN M. KELLY, Associate Professor of Hearing and Speech Sciences
B.A. (St. Bonaventure 1981); M.S., Ph.D. (Syracuse 1984, 1989) [2007]

SHAUL KELNER, Assistant Professor of Sociology and Jewish Studies
B.A. (George Washington 1992); M.Phil., Ph.D. (City University of New York 2000, 2002) [2005]

CRAIG HALL KENNEDY, Professor of Special Education; Associate Dean for Research, Peabody College; Professor of Pediatrics; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A. (California, Santa Barbara 1987); M.S. (Oregon 1988); Ph.D. (California, Santa Barbara 1992) [1997]

ANNE K. KENWORTHY, Associate Professor of Molecular Physiology and Biophysics; Assistant Professor of Cell and Developmental Biology
B.A. (Kenyon 1989); Ph.D. (Duke 1994); M.P.H. (Vanderbilt 2003) [2001]

THOMAS W. KEPHART, Associate Professor of Physics
B.S. (Virginia Polytechnic 1971); M.S. (North Texas State 1975); Ph.D. (Northeastern 1981) [1985]

DOUGLAS S. KERNODLE, David E. Rogers Associate Professor of Medicine; Associate Professor of Microbiology and Immunology
B.A., M.D. (North Carolina 1976, 1981) [1987]

SUHAS L. KETKAR, Professor of Economics
B.A., M.A. (Delhi 1964, 1966); Ph.D. (Vanderbilt 1973) [2008]

DINEO KHABELE, Assistant Professor of Obstetrics and Gynecology; Assistant Professor of Cancer Biology; Adjunct Assistant Professor of Obstetrics and Gynecology at Meharry Medical College
B.A., M.D. (Columbia 1989, 1994) [2005]

JINAH KIM, Assistant Professor of History of Art
B.A., M.A. (Seoul National [Korea] 1998, 1999); Ph.D. (California, Berkeley 2006) [2006]

JOAN E. KING, Professor of Nursing
B.S.N., M.S.N. (Vanderbilt 1972, 1975); Ph.D. (Peabody 1984); R.N., A.N.P. [1975]

HOWARD S. KIRSHNER, Professor of Neurology and Vice Chair of the Department; Director, Division of Stroke; Professor Hearing and Speech Sciences; Professor of Psychiatry; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Williams 1968); M.D. (Harvard 1972) [1978]

STACY KLEIN-GARDNER, Associate Professor of the Practice of Teaching and Learning; Associate Professor of Radiology and Radiological Sciences; Associate Professor of the Practice of Biomedical Engineering
B.S.E. (Duke 1991); M.S. (Drexel 1993); Ph.D. (Vanderbilt 1996) [1999]

ELA W. KNAPIK, Associate Professor of Medicine; Associate Professor of Cell and Developmental Biology; Investigator, Vanderbilt Kennedy Center for Research on Human Development
M.D. (Jagiellonian [Poland] 1987) [2004]

DOUGLAS A. KNIGHT, Drucilla Moore Buffington Professor of Hebrew Bible; Professor of Jewish Studies
B.A. (Ottawa [Kansas] 1965); M.Div. (California Baptist Theological Seminary 1968); Dr.theol. (Georg-August-Universität Göttingen 1973) [1973]

BJORN C. KNOLLMANN, Associate Professor of Medicine; Associate Professor of Pharmacology
M.D. (Cincinnati 1993); Ph.D. (Georgetown 1999) [2005]

PETER E. KONRAD, Associate Professor of Neurological Surgery; Assistant Professor of Biomedical Engineering
B.A. (Rockford 1983); Ph.D., M.D. (Purdue 1988, 1991) [1998]

CHRISTINE L. KONRADI, Professor of Pharmacology; Professor of Psychiatry; Investigator, Center for Molecular Neuroscience; Investigator, Vanderbilt Kennedy Center for Research on Human Development
Ph.D. (Vienna [Austria] 1987) [2006]

DAVID S. KOSSON, Professor of Civil and Environmental Engineering and Chair of the Department; Professor of Chemical Engineering; Professor of Earth and Environmental Sciences
B.S., M.S., Ph.D. (Rutgers 1983, 1984, 1986) [2000]

XENOFON D. KOUTSOUKOS, Associate Professor of Computer Science; Associate Professor of Computer Engineering
Diploma (National Technical University of Athens 1993); M.S. in Applied Mathematics, M.S. in Electrical Engineering, Ph.D. (Notre Dame 1998, 1998, 2000) [2002]

PAUL A. KRAMER, Associate Professor of History
B.A., M.A. (Johns Hopkins 1991, 1991); M.A., Ph.D. (Princeton 1994, 1998) [2009]

MICHAEL KREYLING, Gertrude Conaway Vanderbilt Professor of English; Professor of English
B.A. (Thomas More 1970); M.A., Ph.D. (Cornell 1974, 1975) [1985]

SABINA KUPERSHMIDT, Research Associate Professor of Anesthesiology; Research Associate Professor of Pharmacology
B.S. (Middle Tennessee State 1984); Ph.D. (Vanderbilt 1990) [1998]

MUMIN KURTULUS, Assistant Professor of Management (Operations)
B.S. (Koc [Turkey] 1998); M.S. (Bilkent [Turkey] 2000); M.S., Ph.D. (INSEAD [France] 2002, 2005) [2005]

KONSTANTIN V. KUSTANOVICH, Associate Professor of Slavic Languages and Literatures
Engineering Diploma (Leningrad Polytechnical Institute 1969); M.A. (New York 1977); M.Phil., Ph.D. (Columbia 1983, 1986) [1987]

VERA M. KUTZINSKI, Martha Rivers Ingram Professor of English; Professor of English
Diploma (Smith 1979); M.A., M.A., Ph.D. (Yale 1981, 1982, 1985) [2004]

PATRICIA A. LABOSKY, Associate Professor of Cell and Developmental Biology; Associate Professor of Pharmacology
B.A. (Pennsylvania 1985); Ph.D. (Wesleyan 1992) [2006]

JOHN LACHS, Centennial Professor of Philosophy; Senior Fellow, Institute for Public Policy Studies
B.A., M.A. (McGill 1956, 1957); Ph.D. (Yale 1961) [1967]

D. BORDEN LACY, Assistant Professor of Microbiology and Immunology; Assistant Professor of Biochemistry
B.S. (North Carolina, Chapel Hill 1994); Ph.D. (California, Berkeley 1999) [2006]

PAUL E. LAIBINIS, Professor of Chemical and Biomolecular Engineering
S.B., S.B. (Massachusetts Institute of Technology 1985, 1985); M.A., Ph.D. (Harvard 1987, 1991) [2005]

PETER LAKE, University Distinguished Professor of History; Professor of the History of Christianity
B.A., Ph.D. (Cambridge 1973, 1978) [2008]

LING HON LAM, Assistant Professor of Chinese Literature
B.A. (Hong Kong 1993); M.Phil. (Hong Kong University of Science and Technology 1995); Ph.D. (Chicago 2006) [2007]

JONATHAN LAMB, Andrew W. Mellon Professor in the Humanities; Professor of English
B.A., D.Phil. (York [Canada] 1966, 1971) [2002]

LYNDA L. LAMONTAGNE, Professor of Nursing, Emerita
B.S. (California State, Los Angeles 1970); M.S., D.N.Sc. (California, San Francisco 1972, 1982); R.N. [1989]

LAURENCE E. LANCASTER, Professor of Nursing
B.S.N. (Evansville 1970); M.S.N., Ed.D. (Vanderbilt 1971, 1982); R.N., A.C.N.P. [1973]

JANE GILMER LANDERS, Professor of History
A.B., M.A. (Miami [Florida] 1968, 1974); Ph.D. (Florida 1988) [1992]

KATHLEEN LYNNE LANE, Associate Professor of Special Education; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.A., M.A., Ph.D. (California, Riverside 1988, 1992, 1997) [2001]

MICHAEL LAPOSATA, Edward and Nancy Fody Professor of Pathology; Professor of Medicine
B.S. (Bucknell 1974); M.D., Ph.D. (Johns Hopkins 1981, 1982) [2008]

JOSEPH S. LAPPIN, Professor of Psychology, Emeritus, College of Arts and Science; Research Professor of Psychology, College of Arts and Science; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Cincinnati 1962); Ph.D. (Illinois 1966) [1968]

MICHAEL A. LAPRÉ, E. Bronson Ingram Research Professor of Operations Management; Associate Professor of Management (Operations Management)
Doctorandus (Erasmus University [Rotterdam] 1991); Ph.D. (Institut européen d'Administration des Affaires [France] 1997) [2001]

JANA L. LAUDERDALE, Assistant Dean for Cultural Diversity, School of Nursing; Associate Professor of Nursing
B.S., M.S. (Texas Woman's 1975, 1978); Ph.D. (Utah 1992); R.N. [2004]

KEVIN M. LEANDER, Associate Professor of Language and Literacy
B.A. (Colorado, Boulder 1985); M.A., Ph.D. (Illinois 1995, 1999) [1999]

LARRY J. LEBLANC, Professor of Management (Operations Management)
B.S. (Loyola [Louisiana] 1969); M.S., Ph.D. (Northwestern 1971, 1973) [1980]

EUGENE J. LEBOEUF, Associate Professor of Civil and Environmental Engineering and Associate Department Chair
B.S. (Rose-Hulman Institute of Technology 1985); M.S. (Northwestern 1986); M.S. (Stanford 1993); Ph.D. (Michigan 1998); P.E. [1997]

AKOS LEDECZI, Associate Professor of Computer Engineering
Diploma (Technical University of Budapest 1989); Ph.D. (Vanderbilt 1995) [1996]

ETHAN LEE, Assistant Professor of Cell and Developmental Biology
B.A. (Rice 1987); M.D., Ph.D. (Texas, Southwestern 1997, 1997) [2003]

LAURA ANNE LEE, Assistant Professor of Cell and Developmental Biology
B.A. (Rice 1987); M.D., Ph.D. (Texas, Southwestern 1996, 1996) [2003]

MIREILLE LEE, Assistant Professor of History of Art; Assistant Professor of Classics
A.B. (Occidental College 1991); M.A., Ph.D. (Bryn Mawr 1994, 1999) [2008]

RICHARD LEHRER, Frank W. Mayborn Professor; Professor of Science Education (On leave fall 2010)
B.S. (Rensselaer Polytechnic Institute 1973); M.S., Ph.D. (SUNY, Albany 1976, 1983) [2002]

JENNIFER C. LENA, Assistant Professor of Sociology
A.B. (Colgate 1996); M.A., M.Phil. (Columbia 1999, 1999) [2003]

GALINA I. LEPESHEVA, Research Associate Professor of Biochemistry
M.S. (Belarussian State Technical 1983); Ph.D. (Institute of Bioorganic Chemistry [Belarus] 1993) [2002]

WALLACE M. LESTOURGEON, Professor of Biological Sciences
B.S., Ph.D. (Texas 1966, 1970) [1974]

M. DOUGLAS LEVAN, J. Lawrence Wilson Professor of Engineering; Professor of Chemical and Biomolecular Engineering
B.S. (Virginia 1971); Ph.D. (California, Berkeley 1976) [1997]

DANIEL T. LEVIN, Professor of Psychology, Peabody College
B.A. (Reed 1989); Ph.D. (Cornell 1997) [2003]

AMY-JILL LEVINE, Carpenter Professor of New Testament Studies; Professor of Jewish Studies
A.B. (Smith 1978); A.M., Ph.D. (Duke 1981, 1984) [1994]

CRAIG M. LEWIS, Madison S. Wigginton Professor of Management (Finance)
B.S. (Ohio State 1978); M.S., Ph.D. (Wisconsin 1982, 1986); C.P.A. [1986]

DAVID E. LEWIS, Professor of Political Science and Vice Chair of the Department; Professor of Law
B.A. (California, Berkeley 1992); M.A. (Colorado 1996); M.A., Ph.D. (Stanford 2000) [2008]

CHUN LI, Associate Professor of Biostatistics; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Nankai [China] 1992); M.S. (Ohio State 1998); Ph.D. (Michigan 2002) [2002]

DEYU LI, Associate Professor of Mechanical Engineering
B.E. (University of Science and Technology of China 1992); M.E. (Tsinghua [China] 1997); Ph.D. (California, Berkeley 2003) [2004]

TONG LI, Professor of Economics and Chair of the Department
B.S. (University of Science and Technology [China] 1988); Ph.D. (California, San Diego 1993); Ph.D. (Southern California 1997) [2005]

PENG LIANG, Associate Professor of Cancer Biology
B.S. (Beijing 1982); Ph.D. (Illinois 1990) [1995]

HONG-JUN LIAO, Research Assistant Professor of Biochemistry
M.D., M.Sc. (Second Medical College of PLA [China] 1984, 1991) [2001]

DANIEL CHRISTOPHER LIEBLER, Ayers Professor of Biochemistry; Professor of Pharmacology; Professor of Biomedical Informatics; Director, Center in Proteomics
B.S. (Villanova 1980); Ph.D. (Vanderbilt 1984) [2003]

PAUL C. H. LIM, Assistant Professor of Historical Studies in Religion
B.A. (Yale 1990); M.Div. (Biblical Theological Seminary 1995); Th.M. (Princeton 1997); Ph.D. (Cambridge 2001) [2006]

ANGELA H. LIN, Assistant Professor of German (Died 14 April 2010)
B.A. (Pennsylvania 1991); Ph.D. (Princeton 1999) [2000]

P. CHARLES LIN, Associate Professor of Radiation Oncology; Associate Professor of Cell and Developmental Biology; Associate Professor of Cancer Biology
B.S. (Beijing Normal [China] 1983); Ph.D. (Peking Union Medical College 1988) [1999]

CRAIG W. LINDSLEY, Associate Professor of Pharmacology
B.S. (California State 1992); Ph.D. (California, Santa Barbara 1996) [2006]

ANDREW J. LINK, Associate Professor of Microbiology and Immunology; Assistant Professor of Biochemistry; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.A., B.S., M.A. (Washington University 1987); Ph.D. (Harvard 1994) [1999]

MACRAE F. LINTON, Professor of Medicine; Professor of Pharmacology
B.S. (Tulane 1978); M.D. (Tennessee 1985) [1993]

MARK W. LIPSEY, Research Professor of Human and Organizational Development; Director, Peabody Research Institute
B.S. (Georgia Institute of Technology 1968); Ph.D. (Johns Hopkins 1972) [1992]

RICHARD DOUGLAS LLOYD, Associate Professor of Sociology
B.A. (California, Berkeley 1991); M.A., Ph.D. (Chicago 1995, 2002) [2003]

GORDON DENNIS LOGAN, Centennial Professor of Psychology, College of Arts and Science
B.A., M.Sc. (Alberta 1969, 1972); Ph.D. (McGill 1975) [2000]

LORRAINE M. LOPEZ, Associate Professor of English
B.A. (California State 1989); M.A., Ph.D. (Georgia 1997, 2000) [2002]

NANCY M. LORENZI, Assistant Vice Chancellor for Health Affairs; Professor of Biomedical Informatics; Adjunct Professor of Nursing
A.B. (Youngstown State 1966); M.S. (Case Western Reserve 1968); M.A. (Louisville 1975); Ph.D. (Cincinnati 1980) [2000]

PETER LORGE, Senior Lecturer in History
B.A. (Texas 1989); M.A. (Oxford 1990); Ph.D. (Pennsylvania 1996) [2001]

CHRISTOPHER P. LOSS, Assistant Professor of Public Policy and Higher Education; Assistant Professor of Human and Organizational Development
B.A. (Penn State 1994); M.A., M.A., Ph.D. (Virginia 2000, 2001, 2007) [2007]

DAVID A. LOWE, Professor of Slavic Languages and Literatures, Emeritus
B.A. (Macalester 1969); A.M., Ph.D. (Indiana 1972, 1977) [1979]

BO LU, Associate Professor of Radiation Oncology; Associate Professor of Cancer Biology
M.D. (Baylor 1988); Ph.D. (Pittsburgh 1993) [2002]

DAVID LUBINSKI, Professor of Psychology, Peabody College; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A., Ph.D. (Minnesota 1981, 1987) [1998]

WILLIAM LUIS, Chancellor's Professor of Spanish; Professor of Spanish
B.A. (SUNY, Binghamton 1971); M.A. (Wisconsin 1973); M.A., Ph.D. (Cornell 1979, 1980) [1991]

CHARLES M. LUKEHART, Professor of Chemistry
B.S. (Pennsylvania State 1968); Ph.D. (Massachusetts Institute of Technology 1972) [1973]

ELIZABETH LUNBECK, Nelson Tyrone Jr. Professor of American History; Professor of History and Chair of the Department; Professor of Psychiatry
B.A. (Duke 1975); Ph.D. (Harvard 1984) [2006]

HAOXIANG LUO, Assistant Professor of Mechanical Engineering
B.S., M.S. (Tsinghua [China] 1996, 1999); Ph.D. (California, San Diego 2004) [2007]

MELANIE LUTENBACHER, Associate Professor of Nursing; Associate Professor of Pediatrics; Member, Vanderbilt Kennedy Center for Research on Human Development
B.S.N. (Texas 1974); M.S.N. (California State 1986); Ph.D. (Kentucky 1994); R.N., C.S., F.N.P., P.N.P. [1993]

TERRY P. LYBRAND, Professor of Chemistry; Professor of Pharmacology
B.S. (South Carolina 1980); Ph.D. (California, Berkeley 1984) [2001]

ROBERT L. MACDONALD, Professor of Neurology and Chair of the Department; Professor of Pharmacology; Professor of Molecular Physiology and Biophysics; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
S.B. (Massachusetts Institute of Technology 1966); Ph.D., M.D. (Virginia 1969, 1973) [2001]

MARK A. MAGNUSON, Earl W. Sutherland, Jr. Professor of Molecular Physiology and Biophysics; Professor of Medicine; Professor of Cell and Developmental Biology; Director, Center for Stem Cell Biology; Investigator, Center for Molecular Neuroscience
B.A. (Luther 1975); M.D. (Iowa 1979) [1985]

CHARLES F. MAGUIRE, Professor of Physics
B.S. (Iona 1966); Ph.D. (Yale 1973) [1975]

SANKARAN MAHADEVAN, Professor of Civil and Environmental Engineering; Professor of Mechanical Engineering
B.Tech. (Indian Institute of Technology 1982); M.S. (Rensselaer Polytechnic Institute 1985); Ph.D. (Georgia Institute of Technology 1988) [1988]

ANITA MAHADEVAN-JANSEN, Professor of Biomedical Engineering; Professor of Neurological Surgery
B.Sc., M.Sc. (Bombay 1988, 1990); M.S. (Texas, Austin 1993); Ph.D. (Texas 1996) [1997]

AMY S. MAJOR, Assistant Professor of Medicine; Assistant Professor of Pathology
B.S. (Wheeling Jesuit 1991); Ph.D. (West Virginia 1998) [2002]

BRADLEY A. MALIN, Assistant Professor of Biomedical Informatics; Research Assistant Professor of Computer Science
B.S., M.S., M.Phil., Ph.D. (Carnegie Mellon 2000, 2002, 2003, 2006) [2006]

ANDREA MANESCHI, Professor of Economics; Professor of European Studies
B.A. (Oxford 1958); Ph.D. (Johns Hopkins 1964) [1969]

SUBRAMANI MANI, Assistant Professor of Biomedical Informatics; Assistant Professor of Computer Science
M.D. (Medical College, Trivandrum [India] 1987); M.S. (South Carolina 1994); Ph.D. (Pittsburgh 2005) [2006]

HERBERT R. MARBURY, Assistant Professor of Hebrew Bible
B.A. (Emory 1991); M.Div. (Interdenominational Theological Center 1994); M.A., Ph.D. (Vanderbilt 1999, 2003) [2006]

SALVATORE T. MARCH, David K. Wilson Professor of Management (Information Technology)
B.S., M.S., Ph.D. (Cornell 1972, 1975, 1978) [2000]

LEAH S. MARCUS, Edwin Mims Professor of English; Director of Jewish Studies
B.A. (Carleton 1967); M.A., Ph.D. (Columbia 1968, 1971) [1998]

LAWRENCE J. MARNETT, University Professor; Mary Geddes Stahlman Professor of Cancer Research; Professor of Biochemistry; Professor of Pharmacology; Professor of Chemistry; Director, Vanderbilt Institute of Chemical Biology
B.S. (Rockhurst 1969); Ph.D. (Duke 1973) [1989]

RENÉ MAROIS, Associate Professor of Psychology, College of Arts and Science; Associate Professor of Radiology and Radiological Sciences; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.Sc. (McGill 1986); M.Sc. (Dalhousie 1989); Ph.D. (Yale 1996) [1999]

LLOYD W. MASSENGILL, Professor of Electrical Engineering; Professor of Computer Engineering
B.S., M.S., Ph.D. (North Carolina State 1982, 1984, 1987) [1987]

PIERRE PASCAL MASSION, Associate Professor of Medicine; Associate Professor of Cancer Biology
B.S., M.D. (Université Catholique de Louvain 1983, 1987) [2001]

RONALD W. MASULIS, Frank K. Houston Professor of Management (Finance); Professor of Law
B.A. (Northeastern 1971); M.B.A., Ph.D. (Chicago 1974, 1978) [1990]

DANIEL R. MASYS, Professor of Biomedical Informatics and Chair of the Department; Professor of Medicine
A.B. (Princeton 1971); M.D. (Ohio State 1974) [2005]

MICHAEL E. MATHENY, Assistant Professor of Medicine; Assistant Professor of Biomedical Informatics
B.S., M.D. (Kentucky 1997, 2001); M.S. (Massachusetts Institute of Technology 2006); M.P.H. (Harvard 2007) [2007]

GREGORY C. MATHEWS, Assistant Professor of Neurology; Assistant Professor of Pharmacology; Member, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.S. (Georgetown 1989); M.D., Ph.D. (Washington University 1996, 1996) [2003]

LYNN M. MATRISIAN, Professor of Cancer Biology and Chair of the Department; Associate Professor of Obstetrics and Gynecology; Ingram Professor of Cancer Research
B.S. (Bloomsburg State 1975); Ph.D. (Arizona 1982) [1986]

MICHAELA MATTES, Assistant Professor of Political Science
Bachelors (Rheinische Friedrich-Wilhelms-Universität [Germany] 1999); M.A. (Essex [United Kingdom] 2001); Ph.D. (Rice 2006) [2006]

ROBERT J. MATUSIK, Professor of Urologic Surgery; Professor of Cell and Developmental Biology; Professor of Cancer Biology
B.S. (Loyola 1970); Ph.D. (Rochester 1976) [1996]

JAMES M. MAY, Professor of Medicine; Professor of Molecular Physiology and Biophysics; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Yale 1969); M.D. (Vanderbilt 1973) [1986]

LARRY MAY, W. Alton Jones Professor of Philosophy; Professor of Philosophy; Professor of Law
B.S. (Georgetown 1973); M.A., Ph.D. (New School for Social Research 1976, 1977); J.D. (Washington University 2000) [2009]

DONNA B. MCARTHUR, Professor of Nursing
B.S. (Maryland 1976); M.S.N. (Vanderbilt 1977); Ph.D. (Maryland 1997); A.P.R.N., B.C. [2007]

CLARE M. MCCABE, Associate Professor of Chemical and Biomolecular Engineering
B.S., Ph.D. (Sheffield [U.K.] 1995, 1999) [2004]

HOLLY J. MCCAMMON, Professor of Sociology
B.A. (Purdue 1982); A.M., Ph.D. (Indiana 1986, 1990) [1990]

BRUCE D. MCCANDLISS, Patricia and Rodes Hart Professor of Psychology and Human Development; Professor of Psychology, Peabody College; Professor of Psychology, College of Arts and Science; Member, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Michigan State 1989); M.S., Ph.D. (Oregon 1992, 1997) [2009]

JOHN A. MCCARTHY, Professor of German; Professor of European Studies; Professor of Comparative Literature
B.A. (Oakland 1964); M.A., Ph.D. (SUNY, Buffalo 1967, 1972) [1991]

RICHARD C. MCCARTY, Provost and Vice Chancellor for Academic Affairs; Professor of Psychology, College of Arts and Science; Professor of Pharmacology
B.S., M.S. (Old Dominion 1970, 1972); Ph.D. (Johns Hopkins 1976) [2001]

DEVIN LOCHLAN MCCASLIN, Assistant Professor of Hearing and Speech Sciences
B.S. (Northern Michigan 1992); M.S. (Wayne State 1995); Ph.D. (Ohio State 1999) [2003]

DAVID E. MCCAULEY, Professor of Biological Sciences
B.S. (Maryland 1972); Ph.D. (SUNY, Stony Brook 1976) [1980]

BARBARA JO MCCLURE, Assistant Professor of Religion and Personality
B.A. (Houghton 1989); M.Div. (Princeton 1996); Ph.D. (Emory 2003) [2006]

JOHN S. MCCLURE, Charles G. Finney Professor of Homiletics; Professor of Homiletics; Chair of the Graduate Department of Religion
B.A. (University of the South 1974); M.Phil. (Glasgow [U.K.] 1976); M.Div. (Fuller Theological Seminary 1979); Ph.D. (Princeton Theological Seminary 1983) [2003]

TERENCE E. MCDONNELL, Assistant Professor of Sociology
B.A. (Virginia 2000); Ph.D. (Northwestern 2009) [2009]

THOMAS A. J. MCGINN, Professor of Classics
A.B. (Harvard 1978); M.A. (Cambridge 1980); Ph.D. (Michigan 1986) [1986]

RICHARD MCGREGOR, Associate Professor of Religious Studies
B.A. (Toronto 1990); M.A., Ph.D. (McGill 1993, 2001) [2003]

OWEN PATRICK MCGUINNESS, Professor of Molecular Physiology and Biophysics
B.S. (SUNY, Stony Brook 1978); Ph.D. (Louisiana State 1983) [1984]

HASSANE S. MCHAOURAB, Professor of Molecular Physiology and Biophysics; Professor of Chemistry; Professor of Physics
B.S., M.S. (American University of Beirut 1987, 1989); Ph.D. (Medical College of Wisconsin 1993) [2000]

JAMES OLIVER MCINTYRE, Research Professor of Cancer Biology
B.A., M.A. (Cambridge 1972, 1975); Ph.D. (Vanderbilt 1978) [2001]

RALPH MCKENZIE, Distinguished Professor of Mathematics
B.A., Ph.D. (Colorado 1963, 1966) [1994]

BETHANN MCLAUGHLIN, Assistant Professor of Neurology; Assistant Professor of Pharmacology; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.A. (Skidmore 1990); Ph.D. (Pennsylvania 1997) [2002]

JOHN A. MCLEAN, Assistant Professor of Chemistry
B.S. (Michigan 1995); M.Phil., Ph.D. (George Washington 1998, 2001) [2006]

MICHAEL K. MCLENDON, Associate Dean of Peabody College and Chief of Staff; Associate Professor of Public Policy and Higher Education
B.A. (Baylor 1991); M.S. (Florida State 1994); Ph.D. (Michigan 2000) [1999]

DOUGLAS G. MCMAHON, Professor of Biological Sciences; Professor of Pharmacology; Investigator, Center for Molecular Neuroscience; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.A., Ph.D. (Virginia 1980, 1986) [2002]

TIMOTHY P. MCNAMARA, Professor of Psychology, College of Arts and Science; Professor of Ophthalmology and Visual Sciences; Vice Provost for Faculty
B.G.S. (Kansas 1979); M.S., M.Phil., Ph.D. (Yale 1981, 1982, 1984) [1983]

ANNA L. MEANS, Assistant Professor of Surgery; Assistant Professor of Cell and Developmental Biology
B.S. (Ohio 1984); Ph.D. (Wisconsin 1991) [2000]

JOSÉ MEDINA, Associate Professor of Philosophy
B.A. (Universidad de Sevilla 1991); M.A., Ph.D. (Northwestern 1995, 1998) [1999]

M. DOUGLAS MEEKS, Cal Turner Chancellor's Professor of Wesleyan Studies; Professor of Wesleyan Studies and Theology
B.A. (Rhodes 1963); B.D., Ph.D. (Duke 1966, 1971) [1998]

JENS MEILER, Assistant Professor of Chemistry; Assistant Professor of Pharmacology; Assistant Professor of Biomedical Informatics
B.Sc., M.Sc. (Leipzig [Germany] 1995, 1998); Ph.D. (Frankfurt [Germany] 2001) [2005]

HERBERT Y. MELTZER, Bixler/Johnson/Mays Professor of Psychiatry; Professor of Pharmacology; Director, Division of Psychopharmacology; Investigator, Center for Molecular Neuroscience; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Cornell 1958); M.A. (Harvard 1959); M.D. (Yale 1963) [1996]

W. DAVID MERRYMAN, Assistant Professor of Biomedical Engineering
B.S., M.S. (Tennessee 2001, 2002); Ph.D. (Pittsburgh 2007) [2009]

BARBARA O. MEYRICK, Professor of Pathology; Professor of Medicine
M.Phil., Ph.D. (London 1974, 1976) [1981]

MICHAEL I. MIGA, Associate Professor of Biomedical Engineering; Associate Professor of Radiology and Radiological Sciences; Associate Professor of Neurological Surgery
B.S., M.S. (Rhode Island 1992, 1994); Ph.D. (Dartmouth 1998) [2000]

MICHAEL L. MIHALIK, Professor of Mathematics
B.S. (California State College [Pennsylvania] 1973); M.A., Ph.D. (SUNY, Binghamton 1977, 1979) [1982]

CALVIN F. MILLER, Professor of Earth and Environmental Sciences
B.A. (Pomona 1969); M.S. (George Washington 1973); Ph.D. (California, Los Angeles 1977) [1977]

DAVID M. MILLER III, Professor of Cell and Developmental Biology; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.S. (Southern Mississippi 1973); Ph.D. (Rice 1981) [1994]

GERALDINE G. MILLER, Professor of Medicine; Associate Professor of Microbiology and Immunology
S.B. (Massachusetts Institute of Technology 1969); M.D. (California, San Diego 1973) [1990]

MOLLY FRITZ MILLER, Professor of Earth and Environmental Sciences
B.A. (Wooster 1969); M.S. (George Washington 1971); Ph.D. (California, Los Angeles 1977) [1977]

RANDOLPH A. MILLER, Donald A. B. and Mary M. Lindberg University Professor of Biomedical Informatics; Professor of Medicine; Professor of Nursing
A.B. (Princeton 1971); M.D. (Pittsburgh 1976) [1994]

TRACY G. MILLER, Associate Professor of History of Art
B.A. (Arizona State 1991); M.A., Ph.D. (Pennsylvania 1996, 2000) [2000]

BONNIE J. MILLER-MCLEMORE, Carpenter Professor of Pastoral Theology; Professor of Pastoral Counseling and Pastoral Theology
B.A. (Kalamazoo 1977); M.A., Ph.D. (Chicago 1980, 1986) [1995]

HENRY RICHARD MILNER, Associate Professor of Education
B.A., M.A.T. (South Carolina State 1996, 1997); M.A. (Ohio State 2000) [2001]

ANN M. MINNICK, Professor of Nursing; Co-Director, Ph.D. in Nursing Science Program
B.S. (Michigan State 1970); M.S.N. (Loyola 1975); Ph.D. (Northwestern 1980); R.N. [2005]

LORRAINE C. MION, Visiting Independence Foundation Professor of Nursing
B.S.N. (St. John College 1976); M.S.N., Ph.D. (Case Western Reserve 1981, 1992); R.N., F.A.A.N. [2007]

ANDREA MIRABILE, Assistant Professor of Italian
Maturità Classica (Liceo Classico Pietro Verri, Lodi [Italy] 1993); Laurea in Letteratura Italiana, Dottorato in Storia della Lingua e della Letteratura Italiana (Università degli Studi di Milano [Italy] 2000, 2003); Ph.D. (North Carolina, Chapel Hill 2005) [2007]

KAROLY MIRNICS, Professor of Psychiatry; Investigator, Center for Molecular Neuroscience; Investigator, Vanderbilt Kennedy Center for Research on Human Development
R.N., M.D., M.S. (Novi Sad [Yugoslavia] 1980, 1986, 1989) [2006]

WILLIAM M. MITCHELL, Professor of Pathology
B.A., M.D. (Vanderbilt 1957, 1960); Ph.D. (Johns Hopkins 1966) [1966]

ROBERT L. MODE, Associate Professor of History of Art
B.A. (Rochester 1962); M.A., Ph.D. (Michigan 1964, 1970) [1967]

CATHERINE MOLINEUX, Assistant Professor of History
B.A., B.S. (Texas 1999, 1999); M.A., Ph.D. (Johns Hopkins 2002, 2005) [2005]

OLE MOLVIG, Assistant Professor of History; Assistant Professor of Physics
B.S. (Wisconsin 1998); M.A., Ph.D. (Princeton 2000, 2006) [2008]

TORIN MONAHAN, Associate Professor of Human and Organizational Development; Associate Professor of Medicine
B.A., M.A. (California State, Northridge 1993, 1996); M.S., Ph.D. (Rensselaer Polytechnic Institute 2002, 2003) [2008]

ELIZABETH J. MOODEY, Assistant Professor of History of Art
B.A. (Tufts 1977); M.A. (Delaware 1987); M.A., Ph.D. (Princeton 1992, 2002) [2006]

ELIZABETH R. MOORE, Associate Professor of Nursing
B.S.N. (Rochester 1974); M.S.N. (Catholic University of America 1981); Ph.D. (Vanderbilt 2005); R.N.C., I.B.C.L.C. [2005]

THOMAS M. MORGAN, Assistant Professor of Pediatrics
B.A., M.D. (Boston 1993, 1997) [2008]

ANDREA MORO, Associate Professor of Economics
Laurea (Università Cà Foscari di Venezia 1991); M.A., Ph.D. (Pennsylvania 1995, 1998) [2007]

JOHN A. MORRIS, JR., Professor of Surgery; Director, Division of Trauma and Surgical Critical Care; Professor of Biomedical Informatics
B.A. (Trinity [Connecticut] 1969); M.D. (Kentucky 1977) [1984]

DOUGLAS PAUL MORTLOCK, Assistant Professor of Molecular Physiology and Biophysics; Assistant Professor of Pediatrics
B.A. (Cornell 1990); Ph.D. (Michigan 1997) [2002]

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
B.A. (Berea 1958); M.D. (Vanderbilt 1962) [1985]

CLAUDIO A. MOSSE, Assistant Professor of Pathology
B.A. (Cornell 1992); M.D., Ph.D. (Virginia 2001, 2001) [2005]

H. GUSTAV MUELLER, Professor of Hearing and Speech Sciences
B.S. (North Dakota State 1969); M.A. (New Mexico State 1971); Ph.D. (Denver 1976) [1991]

LOUIS JOSEPH MUGLIA, Edward Claiborne Stahlman Professor of Pediatrics; Professor of Molecular Physiology and Biophysics; Interim Associate Director, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.S. (Michigan 1981); Ph.D., M.D. (Chicago 1986, 1988) [2008]

SHELAGH A. MULVANEY, Assistant Professor of Nursing; Assistant Professor of Biomedical Informatics; Member, Vanderbilt Kennedy Center for Research on Human Development
B.S., M.S., Ph.D. (Arizona 1985, 1991, 2002) [2005]

GREGORY R. MUNDY, John A. Oates Professor of Translational Medicine; Professor of Medicine; Professor of Pharmacology; Professor of Cancer Biology; Professor of Orthopaedics and Rehabilitation; Director, Center in Bone Biology (Died 25 February 2010)
M.D. (University of Melbourne and Tasmania 1973) [2006]

DEBORAH G. MURDOCK, Research Assistant Professor of Molecular Physiology and Biophysics
B.S. (Georgia 1988); Ph.D. (Carnegie Mellon 1996) [2002]

JOSEPH F. MURPHY, Frank W. Mayborn Professor; Professor of Education; Associate Dean, Peabody College
B.A. (Muskingum 1971); M.S.T. (Chicago 1974); Ph.D. (Ohio State 1980) [2002]

MARILYN L. MURPHY, Professor of Art
B.F.A. (Oklahoma State 1972); M.F.A. (Oklahoma 1978) [1980]

KATHERINE T. MURRAY, Associate Professor of Medicine; Associate Professor of Pharmacology
B.S., M.D. (Duke 1976, 1980) [1989]

VELMA MCBRIDE MURRY, Betts Professor of Education and Human Development; Professor of Human and Organizational Development
B.S. (Tennessee 1974); M.S., Ph.D. (Missouri, Columbia 1985, 1987) [2008]

EMILY C. NACOL, Assistant Professor of Political Science
B.A. (Wellesley 1999); M.Phil. (Cambridge [England] 2000); M.A., Ph.D. (Chicago 2003, 2007) [2009]

LILLIAN B. NANNEY, Professor of Plastic Surgery; Professor of Cell and Developmental Biology; Professor of Medical Education and Administration
B.A. (Vanderbilt 1973); M.S. (Austin Peay State 1977); Ph.D. (Louisiana State 1980) [1980]

MAURY NATION, Associate Professor of Human and Organizational Development
B.A. (Georgia State 1992); Ph.D. (South Carolina 1999) [2003]

MARIAN NEAMTU, Professor of Mathematics
C.Sc. (Slovak Technical University of Bratislava 1988); Drs. (Twente University of Technology 1991) [1992]

AMY NEEDHAM, Professor of Psychology and Human Development; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Knox College 1987); M.A., Ph.D. (Illinois 1989, 1992) [2009]

ERIC G. NEILSON, Hugh J. Morgan Professor of Medicine and Chair of the Department; Professor of Cell and Developmental Biology
B.S. (Denison 1971); M.D. (Alabama 1975); M.S. (Pennsylvania 1987) [1998]

CARIN LYNN NEITZEL, Assistant Professor of Early Childhood Education
B.A., Ph.D. (Indiana 1996, 2003) [2003]

DANA D. NELSON, Gertrude Conaway Vanderbilt Professor of English; Professor of English
B.A. (Indiana [Pennsylvania] 1984); M.A., Ph.D. (Michigan State 1987, 1989) [2004]

KEVIN DEAN NISWENDER, Assistant Professor of Medicine; Assistant Professor of Molecular Physiology and Biophysics
B.S. (Colorado College 1990); Ph.D., M.D. (Vanderbilt 1996, 1998) [2004]

JEANETTE J. NORDEN, Professor of Cell and Developmental Biology
B.A. (California, Los Angeles 1970); Ph.D. (Vanderbilt 1975) [1978]

LINDA D. NORMAN, Senior Associate Dean for Academics, School of Nursing; Professor of Nursing; Co-Director, Ph.D. in Nursing Science Program
B.S.N., M.S.N. (Virginia 1969, 1981); D.S.N. (Alabama, Birmingham 2001); R.N. [1988]

LAURA R. NOVICK, Associate Professor of Psychology, Peabody College; Associate Professor of Psychology, College of Arts and Science
B.S. (Iowa 1981); Ph.D. (Stanford 1986) [1988]

ANTHÈRE NZABATSINDA, Associate Professor of French
B.A. (Université nationale du Rwanda, Butare 1978); M.A., Ph.D. (Montréal 1986, 1993) [1996]

RICHARD M. O'BRIEN, Professor of Molecular Physiology and Biophysics
B.Sc. (Bristol 1984); Ph.D. (Cambridge 1988) [1988]

C. ROBERT O'DELL, Distinguished Research Professor of Astrophysics
B.S.Ed. (Illinois State 1959); Ph.D. (Wisconsin 1962) [2000]

JOHN A. OATES, Thomas F. Frist Professor of Medicine; Professor of Pharmacology
B.A., M.D. (Wake Forest 1953, 1956) [1963]

VOLKER E. OBERACKER, Professor of Physics
Ph.D. (Johann Wolfgang Goethe Universität Frankfurt 1977) [1980]

MOSES E. OCHONU, Assistant Professor of History
B.A. (Bayero [Nigeria] 1997); M.A., Ph.D. (Michigan 1999, 2004) [2004]

THOMAS N. OELTMANN, Associate Professor of Medicine; Associate Professor of Biochemistry
B.S. (Georgia State 1963); Ph.D. (Georgia 1967) [1979]

RALPH N. OHDE, Professor of Hearing and Speech Sciences; Member, Vanderbilt Kennedy Center for Research on Human Development
A.B. (Carthage 1966); M.Ed. (Virginia 1968); Ph.D. (Michigan 1978) [1981]

MELANIE D. OHI, Assistant Professor of Cell and Developmental Biology; Assistant Professor of Structural Biology
B.S. (Pacific Lutheran 1996); Ph.D. (Vanderbilt 2002) [2007]

RYOMA OHI, Assistant Professor of Cell and Developmental Biology
B.S., Ph.D. (Vanderbilt 1993, 1998) [2007]

BUNMI O. OLATUNJI, Assistant Professor of Psychology; Member, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Wisconsin, Stevens Point 2000); M.A., Ph.D. (Arkansas 2002, 2006) [2006]

EMANUELLE K. F. OLIVEIRA, Associate Professor of Portuguese
B.A. (Pontificia Universidade Católica [Brazil] 1988); B.A. (Universidade do Estado do Rio de Janeiro 1989); M.A., Ph.D. (California, Los Angeles 1994, 2001) [2002]

KELLY OLIVER, W. Alton Jones Professor of Philosophy; Professor of Philosophy
B.A. (Gonzaga 1979); M.A., Ph.D. (Northwestern 1980, 1987) [2004]

ALEXANDER OLSHANSKIY, Centennial Professor of Mathematics
B.S., Ph.D., D.Sc. (Moscow State 1968, 1971, 1979) [1998]

BRUCE I. OPPENHEIMER, Professor of Political Science; Professor of Public Policy and Education
A.B. (Tufts 1967); M.A., Ph.D. (Wisconsin 1968, 1973) [1993]

BRIDGET ORR, Associate Professor of English
B.A. (Victoria University of Wellington [New Zealand] 1979); Ph.D. (Cornell 1995) [2002]

NEIL OSHEROFF, John Coniglio Professor of Biochemistry; Professor of Medicine
B.A. (Hobart 1974); Ph.D. (Northwestern 1979) [1983]

DENIS V. OSIN, Associate Professor of Mathematics
B.S., M.S., Ph.D. (Moscow State 1996, 1996, 1999) [2008]

CAGLAR OSKAY, Assistant Professor of Civil and Environmental Engineering
B.S. (Middle East Technical [Turkey] 1998); M.S., M.S., Ph.D. (Rensselaer Polytechnic Institute 2000, 2001, 2003) [2006]

ROBERT H. OSSOFF, Maness Professor of Laryngology and Voice; Professor of Hearing and Speech Sciences; Assistant Vice Chancellor for Compliance
A.B. (Bowdoin 1969); D.M.D, M.D. (Tufts 1973, 1975); M.S. (Northwestern 1981) [1986]

KEVIN G. OSTEEN, Professor of Obstetrics and Gynecology; Professor of Pathology; Director, Women's Reproductive Health Research Center
B.S. (South Carolina 1972); Ph.D. (Medical College of Georgia 1980) [1983]

LUCIUS TURNER OUTLAW, JR., Professor of Philosophy
B.A. (Fisk 1967); Ph.D. (Boston College 1972) [2000]

K. ARTHUR OVERHOLSER, Senior Associate Dean of the School of Engineering; Professor of Biomedical Engineering; Professor of Chemical Engineering
B.E. (Vanderbilt 1965); M.S., Ph.D. (Wisconsin 1966, 1969); P.E. [1971]

ALEXEI V. OVTCHINNIKOV, Assistant Professor of Management (Finance)
B.A. (California, Santa Barbara 1998); M.B.A. (California, Riverside 2000); Ph.D. (Purdue 2004) [2007]

ASLI OZDAS, Assistant Professor of Biomedical Informatics
B.S. (Anadolu [Turkey] 1994); M.S., Ph.D. (Vanderbilt 1996, 2001) [2004]

JAMES CONLIN PACE, Professor of Nursing
B.S.N. (Florida State 1978); M.S.N. (Vanderbilt 1981); D.S.N. (Alabama, Birmingham 1986); M.Div. (Vanderbilt 1988); R.N., A.N.P. [2002]

DAVID L. PAGE, Professor of Pathology; Professor of Preventive Medicine
B.A. (Yale 1962); M.D. (Johns Hopkins 1966) [1972]

TERRY L. PAGE, Professor of Biological Sciences; Director of the Neuroscience Studies Program; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A., M.A., Ph.D. (Texas 1970, 1971, 1974) [1980]

MIGUEL PALACIOS, Assistant Professor of Finance
B.S. (Universidad de los Andes [Colombia] 1997); M.B.A. (Virginia 2001); M.A.in Econ., Ph.D. (California, Berkeley 2005, 2009) [2009]

THOMAS J. PALMERI, Associate Professor of Psychology, College of Arts and Science
B.S. (Carnegie Mellon 1987); Ph.D. (Indiana 1995) [1995]

SOKRATES THEODORE PANTELIDES, University Distinguished Professor; William A. and Nancy F. McMinn Professor of Physics
B.S. (Northern Illinois 1969); M.S., Ph.D. (Illinois 1970, 1973) [1994]

WILLIAM PAO, Associate Professor of Medicine; Associate Professor of Cancer Biology; Ingram Associate Professor of Cancer Research; Associate Professor of Pathology
A.B. (Harvard 1990); M.D., Ph.D. (Yale 1998, 1998) [2009]

JANE H. PARK, Professor of Molecular Physiology and Biophysics
B.S., Ph.D. (Washington University 1946, 1952) [1954]

SOHEE PARK, Professor of Psychology, College of Arts and Science; Professor of Psychiatry; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Cambridge 1982); M.A. (Columbia 1985); Ph.D. (Harvard 1991) [2000]

FRANK L. PARKER, Distinguished Professor of Environmental and Water Resources Engineering; Professor of Engineering Management
S.B. (Massachusetts Institute of Technology 1948); M.S., Ph.D. (Harvard 1950, 1955); P.E. [1967]

FRITZ F. PARL, Professor of Pathology
M.D. (Georg-August-Universität Göttingen 1968); Ph.D. (New York Medical 1978) [1980]

DAVID C. PARSLEY, E. Bronson Ingram Professor of Economics and Finance
B.S. (Kentucky 1977); A.M. (Indiana 1979); Ph.D. (California, Berkeley 1990) [1990]

CYNTHIA B. PASCHAL, Associate Professor of Biomedical Engineering; Associate Professor of Radiology and Radiological Sciences
S.B., S.M. (Massachusetts Institute of Technology 1986, 1986); Ph.D. (Case Western Reserve 1992) [1992]

NEAL R. PATEL, Associate Professor of Pediatrics; Associate Professor of Anesthesiology; Associate Professor of Biomedical Informatics
B.S. (California Polytechnic 1987); M.D. (Southern California 1991); M.P.H. (Vanderbilt 2000) [1997]

DANIEL M. PATTE, Professor of Religious Studies; Professor of New Testament and Early Christianity
B.A. (Grenoble 1958); B.D. (Montpellier 1960); Th.M. (Geneva 1964); Th.D. (Chicago Theological Seminary 1971) [1971]

JAMES A. PATTON, Professor of Radiology and Radiological Sciences; Professor of Physics
B.S., Ph.D. (Western Kentucky 1966, 1972) [1973]

JAMES G. PATTON, Professor of Biological Sciences; Associate Professor of Biochemistry
B.A. (College of Saint Thomas 1980); Ph.D. (Mayo Graduate 1988) [1993]

RICHARD M. PEEK, JR., Mina Cobb Wallace Professor of Gastroenterology and Cancer Prevention; Professor of Medicine; Professor of Cancer Biology
B.S. (Davidson 1984); M.D. (North Carolina 1988) [1995]

KENNETH R. PENCE, Assistant Professor of the Practice of Engineering Management
B.S., M.S., Ph.D. (Vanderbilt 1977, 2003, 2004) [2004]

JOHN S. PENN, Phyllis G. and William B. Snyder M.D. Professor of Ophthalmology and Visual Sciences; Professor of Cell and Developmental Biology; Assistant Dean for Faculty Development; Professor of Medical Education and Administration
B.A. (University of the South 1978); M.S. (West Florida 1981); Ph.D. (Florida State 1984) [1998]

EFRÉN O. PÉREZ, Assistant Professor of Political Science
B.A. (San Diego 1999); M.A., Ph.D. (Duke 2006, 2008) [2008]

DOUGLAS D. PERKINS, Associate Professor of Human and Organizational Development
B.A. (Swarthmore 1980); M.A., Ph.D. (New York 1985, 1990) [2000]

RICHARD ALAN PETERS II, Associate Professor of Electrical Engineering
A.B. (Oberlin 1979); M.S., Ph.D. (Arizona 1985, 1988) [1988]

JESSE D. PETERSON, Assistant Professor of Mathematics
B.S. (Westmont College 2001); Ph.D. (California, Los Angeles 2006) [2008]

JOSH FAVROT PETERSON, Assistant Professor of Medicine; Assistant Professor of Biomedical Informatics
B.S. (Stanford 1992); M.D. (Vanderbilt 1997); M.P.H. (Harvard 2002) [2002]

TODD E. PETERSON, Assistant Professor of Radiology and Radiological Sciences; Director of Nuclear Imaging; Assistant Professor of Physics
B.A. (Gustavus Adolphus 1991); B.A. (Oxford 1993); M.S., Ph.D. (Indiana 1994, 2000) [2003]

DAVID PETRAIN, Assistant Professor of Classics
B.A., Ph.D. (Harvard 1998, 2006) [2006]

CATHLEEN C. PETTEPHER, Professor of Cancer Biology; Professor of Cell and Developmental Biology; Member, Vanderbilt Kennedy Center for Research on Human Development
B.S., B.S., Ph.D. (South Alabama 1985, 1987, 1990) [1990]

JOHN A. PHILLIPS III, David T. Karzon Professor of Pediatrics; Director, Division of Pediatric Genetics; Professor of Biochemistry; Professor of Medicine; Professor of Pathology; Clinical Professor of Nursing; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.S. (North Carolina 1965); M.D. (Wake Forest 1969) [1984]

CHARLOTTE PIERCE-BAKER, Professor of Women's and Gender Studies; Professor of English; Director, Women's and Gender Studies Program
B.A. (Howard 1965); M.A. (Ohio State 1966); Ph.D. (Temple 1985) [2006]

JENNIFER A. PIETENPOL, Director, Vanderbilt-Ingram Cancer Center; B. F. Byrd Jr. Professor of Oncology; Professor of Biochemistry; Professor of Cancer Biology; Professor of Otolaryngology
B.A. (Carleton 1986); Ph.D. (Vanderbilt 1990) [1994]

BONITA PILON, Senior Associate Dean for Faculty Practice, School of Nursing; Professor of Nursing
B.S.N. (Barry 1972); M.N. (Florida 1975); D.S.N. (Alabama 1988); R.N. [2000]

PETER N. PINTAURO, H. Eugene McBrayer Professor of Chemical Engineering and Chair of the Department of Chemical and Biomolecular Engineering
B.S., M.S. (Pennsylvania 1973, 1975); Ph.D. (California, Los Angeles 1980) [2008]

GEORGINE M. PION, Research Associate Professor of Psychology, Peabody College
B.A. (Simpson 1974); M.A., Ph.D. (Claremont 1977, 1980) [1989]

DAVID W. PISTON, Professor of Molecular Physiology and Biophysics; Professor of Physics; Professor of Biomedical Engineering; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Grinnell 1984); M.S., Ph.D. (Illinois 1986, 1989) [1992]

RICHARD N. PITT, JR., Assistant Professor of Sociology
B.S., M.Ed. (Pennsylvania State 1991, 1994); M.A., Ph.D. (Arizona 1999, 2003) [2003]

ROBERT W. PITZ, Professor of Mechanical Engineering and Chair of the Department
B.S. (Purdue 1973); M.S., Ph.D. (California, Berkeley 1975, 1981); P.E. [1986]

JOHN F. PLUMMER III, Professor of English
B.A. (Northern Illinois 1966); M.A. (Indiana 1968); Ph.D. (Washington University 1971) [1971]

PRASAD L. POLAVARAPU, Professor of Chemistry
B.Sc. (Andhra 1970); M.Sc. (Birla Institute of Technology and Science 1972); Ph.D. (Indian Institute of Technology 1977) [1980]

DANIEL B. POLLEY, Assistant Professor of Hearing and Speech Sciences; Assistant Professor of Psychology, College of Arts and Science; Member, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.A. (Richmond 1996); M.S., Ph.D. (California, Irvine 1999, 2001) [2005]

SEAN POLYN, Assistant Professor of Psychology, College of Arts and Science
B.A. (Virginia 1999); M.A., Ph.D. (Princeton 2003, 2005) [2009]

DAHLIA PORTER, Assistant Professor of English
B.A. (New York 1996); M.A. (Illinois 2000); Ph.D. (Pennsylvania 2007) [2007]

NED ALLEN PORTER, Stevenson Professor of Chemistry; Professor of Biochemistry
B.S.Ch.E. (Princeton 1965); Ph.D. (Harvard 1970) [1998]

STEVEN S. POSAVAC, E. Bronson Ingram Associate Professor of Management (Marketing)
B.A. (Knox 1992); M.S., Ph.D. (Utah 1995, 1998) [2007]

ALEXANDER M. POWELL, Assistant Professor of Mathematics
B.S. (Rutgers 1997); M.A., Ph.D. (Maryland 1999, 2003) [2005]

ALVIN C. POWERS, Joe C. Davis Professor of Biomedical Sciences; Professor of Molecular Physiology and Biophysics; Professor of Medicine
B.A. (Virginia 1976); M.D. (Tennessee 1979) [1988]

CHARLES W. POWERS, Professor of Environmental Engineering
B.A. (Haverford 1963); M.Div. (Union Theological Seminary 1966); M.Ph., Ph.D. (Yale 1968, 1969) [2006]

AMBRA POZZI, Associate Professor of Medicine; Associate Professor of Cancer Biology
Ph.D. (Florence [Italy] 1996) [2000]

JOANNA PRESSLEY, Assistant Professor of Mathematics
B.S. (Michigan 1998); M.S., Ph.D. (Maryland 2005, 2008) [2008]

RONALD R. PRICE, Godfrey Hounsfield Professor of Radiology and Radiological Sciences and Director of the Division of Radiological Sciences; Professor of Physics; Member, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Western Kentucky 1964); Ph.D. (Vanderbilt 1971) [1973]

RENÉ PRIETO, Professor of Spanish
B.A., M.A. (Sorbonne 1973, 1974); B.A. (Institut des Langues Orientales 1974); Ph.D. (Stanford 1980) [2002]

JOE B. PUTNAM, JR., Professor of Thoracic Surgery and Chair of the Department; Professor of Biomedical Informatics; Ingram Professor of Cancer Research
A.B., M.D. (North Carolina 1975, 1979) [2004]

VITO QUARANTA, Professor of Cancer Biology
M.D. (Bari [Italy] 1974) [2003]

CHRISTOPHER CHAD QUARLES, Assistant Professor of Radiology and Radiological Sciences; Assistant Professor of Cancer Biology; Assistant Professor of Biomedical Engineering
B.S. (Centenary, Louisiana 1999); Ph.D. (Medical College of Wisconsin 2004) [2007]

RANGARAJ RAMANUJAM, Associate Professor of Management (Organization Studies)
B.S. (Anna [India] 1986); M.B.A. (Indian Institute of Management 1988); M.S., Ph.D. (Carnegie Mellon 1995, 2000) [2008]

AKUNURI V. RAMAYYA, Professor of Physics
B.Sc. hons., M.Sc. (Andhra 1957, 1958); Ph.D. (Indiana 1964); Dr.Phil. Nat.Hon.Causa (Bucharest [Romania] 1999) [1964]

LYNN TARTE RAMEY, Associate Professor of French; Chair of the Department of French and Italian
B.A.S., B.A. (Pennsylvania 1986); M.A. (Indiana 1991); Ph.D. (Harvard 1997) [2001]

MATTHEW RAMSEY, Associate Professor of History
A.B., A.M., Ph.D. (Harvard 1969, 1971, 1978) [1984]

RANDOLPH F. R. RASCH, Adjunct Professor of Nursing
B.S. (Nursing) (Andrews 1974); M.S.N. (Vanderbilt 1979); Ph.D. (Texas, Austin 1988); R.N., F.N.P.-B.C. [2002]

PHILIP D. RASICO, Professor of Spanish and Portuguese
A.B. (Xavier 1974); A.M., Ph.D. (Indiana 1975, 1981) [1984]

MARK RATCHFORD, Assistant Professor of Marketing
B.A. (Virginia Polytechnic Institute and State University 1994); M.B.A. (Rochester 2004); Ph.D. (Colorado 2009) [2009]

JOHN G. RATCLIFFE, Professor of Mathematics and Vice Chair of the Department
B.S., A.M., Ph.D. (Michigan 1970, 1973, 1977) [1985]

JAMES LEE RAY, Professor of Political Science
B.A., M.A. (Ohio State 1966, 1968); Ph.D. (Michigan 1974) [1996]

ROBERT A. REED, Associate Professor of Electrical Engineering and Computer Science
B.S. (East Tennessee State 1990); M.S., Ph.D. (Clemson 1993, 1994) [2004]

CLAUDIA REI, Assistant Professor of Economics; Assistant Professor of History
B.A. (Technical University [Lisbon] 1998); M.A. (New York 2002); Ph.D. (Boston 2008) [2008]

JENNIFER F. REINGANUM, E. Bronson Ingram Professor of Economics; Professor of Law
B.A. (Oberlin 1976); M.A., Ph.D. (Northwestern 1978, 1979) [1995]

NANCY B. REISMAN, Associate Professor of English
B.A. (Tufts 1984); M.F.A. (Massachusetts 1991) [2005]

DANIEL J. RESCHLY, Professor of Education; Professor of Psychology, Peabody College; Member, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Iowa State 1966); M.A. (Iowa 1968); Ph.D. (Oregon 1971) [1998]

GRAHAM RESIDE, Assistant Professor of Divinity
B.A. (Toronto 1988); B.Ed. (York 1989); M.Div. (Princeton Theological Seminary 1994); Ph.D. (Emory 2003) [2006]

ALBERT B. REYNOLDS, Professor of Cancer Biology
B.A. (Kenyon 1978); Ph.D. (Virginia 1985) [1996]

J. ANN RICHMOND, Ingram Professor of Cancer Research; Professor of Cancer Biology; Professor of Medicine; Professor of Cell and Developmental Biology; Assistant Dean for Biomedical Research, Education, and Training
B.S. (Northeast Louisiana 1966); M.N.S. (Louisiana State 1972); Ph.D. (Emory 1979) [1989]

TODD A. RICKETTS, Associate Professor of Hearing and Speech Sciences
B.A., M.A., Ph.D. (Iowa 1989, 1991, 1995) [1999]

SHEILA J. RIDNER, Assistant Professor of Nursing
B.S.N. (Kentucky 1978); M.S.H.S. (St. Francis 1988); M.S.N., Ph.D. (Vanderbilt 2000, 2003); R.N., A.C.N.P.-C. [2004]

JOHN J. RIESER, Professor of Psychology, Peabody College; Member, Vanderbilt Kennedy Center for Research on Human Development
A.B. (Harvard 1971); Ph.D. (Minnesota 1978) [1977]

JOSEPH L. RIFE, Associate Professor of Classics; Associate Professor of Anthropology
A.B. (Kenyon College 1992); M.A., Ph.D. (Michigan 1995, 1999) [2008]

VICTORIA J. RISKO, Professor of Education, Emerita
B.S. (Pittsburgh 1966); M.A., Ed.D. (West Virginia 1969, 1971) [1975]

MARYLYN DERIGGI RITCHIE, Associate Professor of Molecular Physiology and Biophysics; Associate Professor of Biomedical Informatics
B.S. (Pittsburgh, Johnstown 1999); M.S., Ph.D. (Vanderbilt 2002, 2004) [2004]

BETHANY RITTLE-JOHNSON, Associate Professor of Psychology, Peabody College; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Virginia 1994); M.S., Ph.D. (Carnegie Mellon 1996, 1999) [2002]

CARMELO JOSEPH RIZZO, Professor of Chemistry; Professor of Biochemistry
B.S. (Temple 1984); Ph.D. (Pennsylvania 1990) [1992]

L. JACKSON ROBERTS II, T. Edwin Rogers Professor of Pharmacology; Professor of Medicine; Investigator, Center for Molecular Neuroscience
B.A. (Cornell 1965); M.D. (Iowa 1969) [1977]

DAVID ROBERTSON, Elton Yates Professor of Autonomic Disorders; Professor of Medicine; Professor of Pharmacology; Professor of Neurology
B.A., M.D. (Vanderbilt 1969, 1973) [1978]

BETSEY ANN ROBINSON, Associate Professor of History of Art; Associate Professor of Classics
A.B. (Harvard and Radcliffe Colleges 1990); A.L.M. (Harvard Extension 1995); Ph.D. (Pennsylvania 2001) [2008]

WILLIAM FRANCIS ROBINSON, Assistant Professor of History; Associate Director, Center for Latin American Studies
B.A. (Johns Hopkins 1984); M.A. (Florida 1988); Ph.D. (Auburn 1999) [2002]

WILLIAM H. ROBINSON III, Associate Professor of Electrical Engineering; Associate Professor of Computer Engineering
B.S. (Florida Agricultural and Mechanical 1996); M.S., Ph.D. (Georgia Institute of Technology 1998, 2003) [2003]

DAN M. RODEN, William Stokes Professor of Experimental Therapeutics; Professor of Medicine; Professor of Pharmacology; Director, Institute of Experimental Therapeutics; Investigator, Center for Molecular Neuroscience; Assistant Vice Chancellor for Personalized Medicine
B.Sc., M.D.,C.M. (McGill 1970, 1974) [1981]

JOEL RODRIGUE, Assistant Professor of Economics
B.A. (Manitoba 2001); M.A., Ph.D. (Queen's [Ontario] 2002, 2008) [2008]

ANNA WANG ROE, Professor of Psychology, College of Arts and Science; Associate Professor of Radiology and Radiological Sciences; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Harvard 1984); Ph.D. (Massachusetts Institute of Technology 1991) [2003]

RUTH ROGASKI, Associate Professor of History; Director, Asian Studies Program
B.A. (Pennsylvania 1984); M.A., Ph.D. (Yale 1990, 1996) [2003]

BRIDGET R. ROGERS, Associate Professor of Chemical and Biomolecular Engineering
B.S. (Colorado 1984); M.S., Ph.D. (Arizona State 1990, 1998) [1998]

ANTONIS ROKAS, Assistant Professor of Biological Sciences
B.Sc. (Crete [Greece] 1998); Ph.D. (Edinburgh [U.K.] 2001) [2007]

LOUISE A. ROLLINS-SMITH, Associate Professor of Microbiology and Immunology; Associate Professor of Biological Sciences
B.A. (Hamline 1969); M.S., Ph.D. (Minnesota 1972, 1977) [1984]

SERGIO ROMERO, Assistant Professor of Anthropology
B.A. (Universidad del Valle de Guatemala 1996); M.A. (Tulane 2001); Ph.D. (Pennsylvania 2006) [2006]

ROBERT J. ROSELLI, Professor of Biomedical Engineering, Emeritus; Professor of Chemical Engineering, Emeritus
B.S., M.S., Ph.D. (California, Berkeley 1969, 1972, 1975) [1976]

SAMUEL TRENT ROSENBLOOM, Assistant Professor of Biomedical Informatics; Assistant Professor of Medicine; Instructor in Clinical Nursing; Instructor in Pediatrics; Member, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Northwestern 1992); M.D., M.P.H. (Vanderbilt 1996, 2001) [2001]

SANDRA J. ROSENTHAL, Professor of Chemistry; Professor of Physics; Professor of Pharmacology; Professor of Chemical and Biomolecular Engineering; Director, Vanderbilt Institute for Nanoscale Science and Engineering
B.S. (Valparaiso 1987); Ph.D. (Chicago 1993) [1996]

NORBERT ROSS, Associate Professor of Anthropology
M.A., Ph.D., Habilitation (Freiburg [Germany] 1995, 1998, 2002) [2003]

PETER L. ROUSSEAU, Professor of Economics
B.A., M.S. (Iona 1983, 1986); Ph.D. (New York 1995) [1995]

DEBORAH W. ROWE, Associate Professor of Early Childhood Education
B.S. (Kentucky 1976); M.A.Educ. (Wake Forest 1982); Ph.D. (Indiana 1986) [1986]

CAROL RUBIN, Professor of Mechanical Engineering
B.S. (Columbia 1966); M.S., Ph.D. (Kansas State 1969, 1971); P.E. [1980]

DONALD H. RUBIN, Professor of Medicine; Professor of Microbiology and Immunology
B.A. (SUNY, Stony Brook 1969); M.D. (Cornell 1974) [1992]

EDWARD L. RUBIN, University Professor of Law and Political Science; 2009/2010 FedEx Research Professor
A.B. (Princeton 1969); J.D. (Yale 1979) [2005]

HENRY EARL RULEY, Professor of Microbiology and Immunology
A.B. (Stanford 1974); Ph.D. (North Carolina 1980) [1992]

WILLIAM EVANS RUSSELL, Professor of Pediatrics; Professor of Cell and Developmental Biology; Director, Division of Pediatric Endocrinology
B.S. (Michigan 1972); M.D. (Harvard 1976) [1990]

SUSAN SAEGERT, Professor of Human and Organizational Development
B.A. (Texas, Austin 1968); Ph.D. (Michigan 1974) [2008]

EDWARD B. SAFF, Professor of Mathematics
B.S. (Georgia Institute of Technology 1964); Ph.D. (Maryland 1968) [2001]

KAMAL SAGGI, Professor of Economics; Director of the Graduate Program in Economic Development
B.A. (Ohio Wesleyan 1990); M.A., Ph.D. (Pennsylvania 1992, 1995) [2010]

JACOB S. SAGI, Vanderbilt Financial Markets Research Center Associate Professor of Management (Finance)
B.Sc. (Toronto 1991); Ph.D., Ph.D. (British Columbia 1995, 2000) [2007]

MICHELE S. SALISBURY, Assistant Professor of Nursing
M.S.N. (Vanderbilt 1985); Ph.D. (Texas 1993); R.N., W.H.N.P. [1994]

DAVID CHARLES SAMUELS, Associate Professor of Molecular Physiology and Biophysics
B.A. (University of Washington 1983); Ph.D. (Oregon 1990) [2009]

MARIANO SANA, Associate Professor of Sociology
B.A. (Buenos Aires [Argentina] 1991); M.A., Ph.D. (Pennsylvania 1998, 2003) [2009]

FLORENCE SANCHEZ, Associate Professor of Civil and Environmental Engineering
D.E.A., Ph.D. (National Institute of Applied Sciences 1992, 1996) [2001]

CHARLES R. SANDERS II, Professor of Biochemistry; Investigator, Center for Molecular Neuroscience
B.S. (Milligan 1983); Ph.D. (Ohio State 1988) [2002]

ELAINE SANDERS-BUSH, Professor of Pharmacology, Emerita; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.S. (Western Kentucky 1962); Ph.D. (Vanderbilt 1967) [1968]

HOWARD M. SANDLER, Professor of Psychology, Peabody College
B.A. (Johns Hopkins 1967); M.A., Ph.D. (Northwestern 1969, 1971) [1970]

SAMUEL ANDREW SANTORO, Dorothy B. and Theodore R. Austin Professor of Pathology and Chair of the Department; Professor of Biochemistry
B.S. (Emory 1972); M.D., Ph.D. (Vanderbilt 1979, 1979) [2003]

MARK V. SAPIR, Centennial Professor of Mathematics; Professor of Mathematics
Diploma (Ural State 1978); Ph.D. (Moscow Pedagogical Institute 1983) [1997]

REBECCA M. SAPPINGTON, Assistant Professor of Ophthalmology and Visual Sciences; Assistant Professor of Pharmacology
B.S. (Washington College 2000); M.S., Ph.D. (Rochester 2003, 2004) [2009]

NILANJAN SARKAR, Associate Professor of Mechanical Engineering; Associate Professor of Computer Engineering; Member, Vanderbilt Kennedy Center for Research on Human Development
B.E. (Calcutta 1985); M.E. (Indian Institute of Science 1988); Ph.D. (Pennsylvania 1993) [2000]

JACK M. SASSON, Mary Jane Werthan Professor of Jewish Studies and Hebrew Bible; Professor of Classics
B.A. (Brooklyn 1962); Ph.D. (Brandeis 1966) [1999]

MEGAN M. SAYLOR, Associate Professor of Psychology, Peabody College; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.A. (California, Berkeley 1996); M.S., Ph.D. (Oregon 1997, 2001) [2001]

STEPHEN R. SCHACH, Professor of Computer Science, Emeritus; Professor of Computer Engineering, Emeritus
B.Sc., B.Sc. hons, M.Sc. (Cape Town 1966, 1967, 1969); M.Sc. (Weizmann Institute of Science 1972); Ph.D. (Cape Town 1973) [1983]

ALLISON SCHACHTER, Assistant Professor of Jewish Studies and English
B.A. (Stanford 1996); Ph.D. (California, Berkeley 2006) [2006]

JEFFREY D. SCHALL, E. Bronson Ingram Professor of Neuroscience
B.S. (Denver 1982); Ph.D. (Utah 1986) [1989]

LEONA SCHAUBLE, Professor of Education (On leave fall 2010)
A.B. (Bates 1968); Ph.D., M.A. (Columbia 1989, 1996) [2002]

ERIC SCHECHTER, Associate Professor of Mathematics
B.S. (Maryland 1973); M.S., Ph.D. (Chicago 1975, 1978) [1980]

ROBERT J. SCHERRER, Professor of Physics and Chair of the Department of Physics and Astronomy
A.B. (Princeton 1981); M.A. (Cambridge 1983); Ph.D. (Chicago 1986) [2003]

KEVIN L. SCHEY, Professor of Biochemistry; Professor of Ophthalmology and Visual Sciences
B.S. (Muhlenberg 1984); Ph.D. (Purdue 1989) [2008]

DAVID G. SCHLUNDT, Associate Professor of Psychology, College of Arts and Science
A.B. (Indiana 1976); M.S. (Wisconsin 1979); Ph.D. (Indiana 1982) [1985]

DOUGLAS C. SCHMIDT, Professor of Computer Science and Associate Chair of the Department; Professor of Computer Engineering
B.A., M.A. (William and Mary 1984, 1986); M.S., Ph.D. (California, Irvine 1990, 1994) [2002]

CLAUS SCHNEIDER, Assistant Professor of Pharmacology
B.A., Ph.D. (Würzburg [Germany] 1987, 1996) [2001]

SANDRA L. SCHNEIDER, Associate Professor of Hearing and Speech Sciences; Assistant Professor of Neurology
B.S. (Western Michigan 1974); M.S. (Vanderbilt 1976); Ph.D. (Northwestern 1996) [2006]

MARK L. SCHOENFIELD, Professor of English and Chair of the Department
B.A. (Yale 1981); A.M., M.P.W., Ph.D. (Southern California 1986, 1986, 1989) [1990]

RONALD D. SCHRIMPF, Orrin Henry Ingram Professor of Engineering; Professor of Electrical Engineering; Professor of Computer Engineering
B.E.E., M.S.E.E., Ph.D. (Minnesota 1981, 1984, 1986) [1996]

KENNETH E. SCHRIVER, Senior Lecturer in Physics
B.A. (Reed 1985); Ph.D. (California, Los Angeles 1990) [2001]

C. MELANIE SCHUELE, Assistant Professor of Hearing and Speech Sciences; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.S.Ed. (Miami 1981); M.A. (Texas 1985); Ph.D. (Kansas 1995) [2002]

LARRY L. SCHUMAKER, Stevenson Professor of Mathematics
B.S. (South Dakota School of Mines 1961); M.S., Ph.D. (Stanford 1962, 1966) [1988]

THOMAS ALAN SCHWARTZ, Professor of History; Professor of Political Science; Professor of European Studies
A.B. (Columbia 1976); M.A. (Oxford 1978); A.M., Ph.D. (Harvard 1979, 1985) [1990]

KATHRYN SCHWARZ, Associate Professor of English
A.B., M.A., Ph.D. (Harvard 1988, 1990, 1994) [1996]

CHARLES E. SCOTT, Distinguished Professor of Philosophy
B.D. (Southern Methodist 1957); B.D., M.A., Ph.D. (Yale 1961, 1962, 1965) [2005]

VIRGINIA M. SCOTT, Professor of French
B.A. (Eckerd 1973); M.A. (Florida State 1975); Ph.D. (Emory 1987) [1988]

GARY D. SCUDDER, Justin Potter Professor of American Competitive Enterprise (Operations Management); Faculty Director, International Programs, Owen Graduate School of Management
B.S., M.S. (Purdue 1974, 1975); Ph.D. (Stanford 1981) [1990]

LINDA SEALY, Associate Professor of Molecular Physiology and Biophysics; Associate Professor of Cell and Developmental Biology; Associate Professor of Cancer Biology
B.A. (Illinois Wesleyan 1976); Ph.D. (Iowa 1980) [1986]

ERIC SEBZDA, Assistant Professor of Microbiology and Immunology
B.Sc., Ph.D. (Toronto 1992, 1998) [2007]

ADAM SEEGMILLER, Assistant Professor of Pathology
B.S. (Utah 1997); M.D., Ph.D. (Texas Southwestern 2004, 2004) [2009]

FERNANDO F. SEGOVIA, Oberlin Graduate Professor of New Testament; Professor of New Testament and Early Christianity
B.A. (Pontifical College Josephinum 1970); M.A., Ph.D. (Notre Dame 1976, 1978) [1984]

ANDRIANE E. SEIFFERT, Assistant Professor of Psychology, College of Arts and Science
B.S. (Waterloo 1995); M.A., Ph.D. (Harvard 1998, 2000) [2004]

MITCHELL A. SELIGSON, Centennial Professor of Political Science; Professor of Political Science
B.A. (City University of New York 1967); M.A. (Florida 1968); Ph.D. (Pittsburgh 1974) [2004]

PRATIM SENGUPTA, Assistant Professor of Science Education
B.S. (Presidency College [India] 1998); M.S. (Indian Institute of Technology 2000); M.S., Ph.D. (Northwestern 2003, 2009) [2009]

GREGORY C. SEPHEL, Associate Professor of Pathology
B.S. (California, Irvine 1973); Ph.D. (Utah 1986) [1988]

DIETER H. O. SEVIN, Professor of Germanic Languages and Literatures and Chair of the Department
B.A. (San Jose State 1963); M.A., Ph.D. (University of Washington 1964, 1967) [1968]

MIRIAM SHAKOW, Assistant Professor of Anthropology
B.A. (Swarthmore 1997); Ph.D. (Harvard 2008) [2008]

TRACY DENEAN SHARPLEY-WHITING, Professor of African American and Diaspora Studies; Professor of French; Director, African American and Diaspora Studies Program; Director, William T. Bandy Center for Baudelaire and Modern French Studies
B.A. (Rochester 1989); M.A. (Miami [Ohio] 1990); Ph.D. (Brown 1994) [2004]

SAMIRA SHEIKH, Assistant Professor of History
B.A. (Maharaja Sayajirao [India] 1992); M.A., M.Phil. (Jawaharlal Nehru [India] 1994, 1996); D.Phil. (Wolfson College, Oxford [England] 2003) [2009]

PAUL D. SHELDON, Professor of Physics
A.B., Ph.D. (California, Berkeley 1980, 1986) [1991]

RICHARD C. SHELTON, James G. Blakemore Research Professor of Psychiatry; Professor of Pharmacology; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience; Director, Division of Adult Psychiatry
B.S. (East Tennessee State 1975); M.D. (Louisville 1979) [1985]

VIRGINIA L. SHEPHERD, Professor of Pathology; Associate Professor of Biochemistry; Professor of Medicine
B.S., M.S., Ph.D. (Iowa 1970, 1972, 1975) [1988]

RICHARD G. SHIAVI, Professor of Biomedical Engineering, Emeritus; Professor of Electrical Engineering, Emeritus
B.S. (Villanova 1965); M.S., Ph.D. (Drexel Institute of Technology 1969, 1972) [1972]

BIH-HWA SHIEH, Associate Professor of Pharmacology and Vice Chair of the Department; Investigator, Center for Molecular Neuroscience
B.S., M.S. (National Taiwan 1979, 1981); Ph.D. (SUNY, Stony Brook 1986) [1991]

MARYBETH SHINN, Professor of Human and Organizational Development and Chair of the Department
B.A. (Radcliffe 1973); M.A., Ph.D. (Michigan 1976, 1978) [2008]

MOTOTSUGU SHINTANI, Associate Professor of Economics
B.A., M.A. (Osaka 1991, 1993); M.Phil., Ph.D. (Yale 1998, 2000) [2000]

MASAKAZU SHIOTA, Assistant Professor of Molecular Physiology and Biophysics
B.Vet. (Rakuno Gakuen [Japan] 1976); D.V.M. (Ministry of Agriculture and Forestry of Japan 1976); M.Agr., Ph.D. (Osaka Prefecture 1978, 1987) [1996]

MIKHAEL SHOR, Assistant Professor of Management (Economics)
B.A. (Virginia 1994); M.A., Ph.D. (Rutgers 1997, 2001) [2001]

EDWARD K. SHULTZ, Associate Professor of Biomedical Informatics; Associate Professor of Pathology
B.S. (Oregon 1975); M.D. (Yale 1979); M.S. (Minnesota 1984) [1997]

YU SHYR, Professor of Biostatistics; Ingram Professor of Cancer Research; Professor of Preventive Medicine
B.B. (Tamkang [Taiwan] 1985); M.S. (Michigan State 1989); Ph.D. (Michigan 1994) [1994]

JOHN J. SIEGFRIED, Professor of Economics, Emeritus
B.S. (Rensselaer Polytechnic Institute 1967); M.A. (Pennsylvania State 1968); M.S., Ph.D. (Wisconsin 1971, 1972) [1972]

NABIL SIMAAN, Associate Professor of Mechanical Engineering
B.S., M.S., Ph.D. (Technion Israel Institute of Technology 1994, 1999, 2002) [2010]

GIERI SIMONETT, Professor of Mathematics
M.S., Ph.D. (Universität Zürich 1988, 1992) [1995]

HELENA SIMONETT, Assistant Professor of Latin American Studies; Adjunct Assistant Professor of Music History and Literature; Associate Director, Latin American Studies
Lic.Phil. I (Zurich [Switzerland] 1992); Ph.D. (California, Los Angeles 1997) [1999]

VAUGHN G. SINCLAIR, Professor of Nursing
B.S.N., M.S.N. (Vanderbilt 1974, 1978); Ph.D. (Peabody 1982); R.N., C.S. [1982]

CHARLES K. SINGLETON, Professor of Biological Sciences and Chair of the Department; Member, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Georgia 1976); Ph.D. (Purdue 1980) [1984]

MARCY ANN SIPES, Assistant Professor of Hearing and Speech Sciences
B.A., M.S. (Western Kentucky 1985, 1987) [2008]

ERIC PATRICK SKAAR, Associate Professor of Microbiology and Immunology
B.S. (Wisconsin 1996); M.P.H., Ph.D. (Northwestern 2002, 2002) [2005]

PAIGE M. SKIBA, Assistant Professor of Law
B.A. (Amherst 1999); Ph.D. (California, Berkeley 2007) [2007]

JOHN M. SLOOP, Professor of Communication Studies; Senior Associate Dean, College of Arts and Science
B.S. (Appalachian State 1985); M.A. (Georgia 1988); Ph.D. (Iowa 1992) [1995]

CRAIG A. SMITH, Associate Professor of Psychology, Peabody College; Investigator, Vanderbilt Kennedy Center for Research on Human Development
A.B. (Dartmouth 1980); Ph.D. (Stanford 1986) [1988]

HELMUT WALSER SMITH, Martha Rivers Ingram Professor of History; Professor of History; Professor of European Studies; Director, Max Kade Center for European and German Studies
A.B. (Cornell 1984); M.Phil., Ph.D. (Yale 1988, 1992) [1991]

JEFFREY ROSER SMITH, Associate Professor of Medicine; Associate Professor of Cancer Biology; Ingram Associate Professor of Cancer Research
A.B. (Harvard 1985); M.D., Ph.D. (Texas Southwestern Medical School 1992) [1999]

TED A. SMITH, Director of the Program in Theology and Practice; Assistant Professor of Ethics and Preaching
B.A. (Duke 1990); B.A. (Oxford 1992); M.Div. (Princeton 1995); Ph.D. (Emory 2004) [2005]

THOMAS M. SMITH, Associate Professor of Public Policy and Education
B.A. (California. Los Angeles 1988); M.A. (Columbia 1991); M.A. (Catholic 1995); Ph.D. (Pennsylvania State 2000) [2001]

WILLIAM P. SMITH, Professor of Psychology, Emeritus, College of Arts and Science
B.A. (Duke 1958); M.A., Ph.D. (North Carolina 1962, 1963) [1965]

CLAIRE E. SMREKAR, Associate Professor of Public Policy and Education
B.A. (California, Los Angeles 1982); M.A., M.A., Ph.D. (Stanford 1986, 1989, 1991) [1991]

C. MELISSA SNARR, Assistant Professor of Ethics and Society
B.A. (Furman 1992); M.Div. (Candler School of Theology 1995); Ph.D. (Emory 2004) [2003]

LIJUN SONG, Assistant Professor of Sociology; Assistant Professor of Medicine, Health, and Society
B.A., M.A. (Shandong [China] 2000, 2003); Ph.D. (Duke 2009) [2009]

E. MICHELLE SOUTHARD-SMITH, Associate Professor of Medicine; Associate Professor of Cell and Developmental Biology; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
Ph.D. (Texas Southwestern Medical Center 1992) [1999]

PAUL W. SPEER, Associate Professor of Human and Organizational Development (On leave fall 2010)
B.S. (Baker 1982); Ph.D. (Missouri, Kansas City 1992) [2001]

W. ANDERSON SPICKARD III, Associate Professor of Medicine; Associate Professor of Biomedical Informatics
B.A. (North Carolina 1985); M.D. (Vanderbilt 1989); M.S. (Virginia 1995) [1995]

BEN SPILLER, Assistant Professor of Pharmacology; Assistant Professor of Microbiology and Immunology
B.S. (California, Davis 1994); Ph.D. (California, Berkeley 1999) [2006]

JEREMY P. SPINRAD, Associate Professor of Computer Science
B.S. (Yale 1978); M.S.E., M.A., Ph.D. (Princeton 1979, 1980, 1982) [1985]

SUBRAMANIAM SRIRAM, William C. Weaver III Professor of Experimental Neurology; Professor of Neurology; Professor of Microbiology and Immunology; Investigator, Center for Molecular Neuroscience
M.B.,B.S. (Madras 1973) [1993]

ROBERT E. STAMMER, JR., Associate Professor of Civil Engineering; Director, Engineering Science Program
B.S. (Middle Tennessee State 1971); B.E. (Vanderbilt 1972); M.S. (Georgia Institute of Technology 1974); Ph.D. (Tennessee 1982); P.E. [1981]

GREGG D. STANWOOD, Assistant Professor of Pharmacology; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.A. (Temple 1991); Ph.D. (Pennsylvania 1997) [2002]

JOHN MALOTTE STARMER, Assistant Professor of Biomedical Informatics
B.S. (North Carolina State 1989); M.D. (Wake Forest 1995) [2004]

KEIVAN GUADALUPE STASSUN, Associate Professor of Astronomy
A.B. (California, Berkeley 1994); Ph.D. (Wisconsin 2000) [2003]

WILLIAM W. STEAD, Associate Vice Chancellor for Health Affairs; Professor of Medicine; McKesson Foundation Professor of Biomedical Informatics; Director, Informatics Center
A.B., M.D. (Duke 1970, 1973) [1991]

JAMES H. STEIGER, Professor of Psychology, Peabody College
B.A. (Cornell 1970); M.S. (Oklahoma 1972); Ph.D. (Purdue 1976) [2003]

ROLAND W. STEIN, Professor of Molecular Physiology and Biophysics; Professor of Cell and Developmental Biology
B.A. (California, Los Angeles 1975); M.A., Ph.D. (Albert Einstein 1980, 1981) [1986]

RONNIE J. STEINBERG, Professor of Sociology
B.A. (Bennington 1969); M.A., Ph.D. (New York 1973, 1977) [1997]

SONYA STERBA, Assistant Professor of Psychology, Peabody College
B.A. (Brown 2002); M.A., Ph.D. (North Carolina 2005, 2009) [2010]

PHOEBE L. STEWART, Associate Professor of Molecular Physiology and Biophysics
A.B. (Harvard 1984); Ph.D. (Pennsylvania 1987) [2002]

HANS R. STOLL, Anne Marie and Thomas B. Walker Jr. Professor of Finance; Director, Financial Markets Research Center
B.A. (Swarthmore 1961); M.B.A., Ph.D. (Chicago 1963, 1966) [1980]

MICHAEL P. STONE, Professor of Chemistry and Chair of the Department; Professor of Biochemistry
B.S. (California, Davis 1977); Ph.D. (California, Irvine 1981) [1984]

CHARLES W. STRATTON, Associate Professor of Pathology; Associate Professor of Medicine
B.S. (Bates 1967); M.D. (Vermont 1971) [1979]

ALVIN M. STRAUSS, Professor of Mechanical Engineering
B.A. (City University of New York, Hunter College 1964); Ph.D. (West Virginia 1968) [1982]

GERALD J. STUBBS, Professor of Biological Sciences; Professor of Molecular Biology
B.Sc. (Australian National 1968); D.Phil. (Oxford 1972) [1983]

GARY ALLEN SULIKOWSKI, Stevenson Professor of Chemistry; Professor of Chemistry; Professor of Biochemistry
B.S. (Wayne State 1983); Ph.D. (Pennsylvania 1989) [2004]

MICHELLE MILLER SULIKOWSKI, Senior Lecturer in Chemistry
B.A. (Rosemont 1986); Ph.D. (Pennsylvania 1991) [2004]

ZU-WEN SUN, Assistant Professor of Biochemistry
B.S. (Tunghai 1983); M.A. (North Carolina State 1991); Ph.D. (Louisiana State 1996) [2003]

JAMES S. SUTCLIFFE, Associate Professor of Molecular Physiology and Biophysics; Associate Professor of Psychiatry; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.S. (Auburn 1986); Ph.D. (Emory 1992) [1997]

IOANA SUVAINA, Assistant Professor of Mathematics
B.S. (Bucharest [Romania] 1999); Ph.D. (SUNY, Stony Brook 2006) [2009]

CAROL M. SWAIN, Professor of Political Science; Professor of Law
B.A. (Roanoke 1983); M.A. (Virginia Polytechnic and State 1984); Ph.D. (North Carolina 1989) [1999]

GEORGE H. SWEENEY, Associate Dean of the College of Arts and Science; Associate Professor of Economics
B.S. (Massachusetts Institute of Technology 1972); M.A., Ph.D. (Northwestern 1973, 1977) [1976]

LARRY L. SWIFT, Professor of Pathology; Director, Division of Investigative Pathology
B.S. (Indiana Central 1967); Ph.D. (Vanderbilt 1971) [1971]

JANOS SZTIPANOVITS, E. Bronson Ingram Distinguished Professor of Engineering; Professor of Electrical Engineering; Professor of Computer Engineering; Professor of Computer Science
Diploma, Ph.D. (Technical University of Budapest 1970, 1980) [1983]

DAVID L. TABB, Assistant Professor of Biomedical Informatics; Assistant Professor of Biochemistry
B.S. (Arkansas 1996); Ph.D. (University of Washington 2003) [2005]

TAKAMUNE TAKAHASHI, Assistant Professor of Medicine; Assistant Professor of Cancer Biology
M.D., Ph.D. (Jikei [Japan] 1988, 1994) [1999]

ROBERT BASIL TALISSE, Professor of Philosophy; Professor of Political Science
B.A. (WIlliam Paterson 1993); M.A. (New York 1995); M.Phil., Ph.D. (City University of New York 1998, 2000) [2001]

WILLIAM P. TANSEY, Professor of Cell and Developmental Biology
B.Sc., Ph.D. (Sydney [Australia] 1988, 1991) [2009]

JOEL TELLINGHUISEN, Professor of Chemistry
B.A. (Cornell 1965); Ph.D. (California, Berkeley 1969) [1975]

STEVEN J. TEPPER, Assistant Professor of Sociology; Associate Director, Curb Center for Art, Enterprise, and Public Policy
B.A. (North Carolina 1989); M.P.P. (Harvard 1996); Ph.D. (Princeton 2001) [2004]

RACHEL TEUKOLSKY, Assistant Professor of English
B.A. (Harvard 1996); Ph.D. (California, Berkeley 2004) [2008]

ANNE MARIE THARPE, Professor of Hearing and Speech Sciences and Chair of the Department; Professor of Otolaryngology; Member, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Arizona 1979); M.S., Ph.D. (Vanderbilt 1980, 1994) [1986]

JOHN J. THATAMANIL, Assistant Professor of Theology
B.A. (Washington University 1988); M.Div., Ph.D. (Boston University 1991, 2000) [2003]

JAMES WARD THOMAS II, Professor of Medicine; Professor of Microbiology and Immunology; Director, Division of Rheumatology
B.A. (Southwestern at Memphis 1970); M.D. (Tennessee 1973) [1990]

REID CARLETON THOMPSON, Professor of Neurological Surgery; Associate Professor of Biomedical Engineering; Director, Section of Neurosurgical Oncology
B.A. (Maryland 1985); M.D. (Johns Hopkins 1989) [2002]

J. MICHAEL THOMSON, Assistant Professor of Cancer Biology
B.S., M.S. (Georgia 1993, 1996); Ph.D. (Florida, Gainesville 2003) [2008]

TRICIA ANN THORNTON-WELLS, Assistant Professor of Molecular Physiology and Biophysics; Assistant Professor of Biomedical Informatics
B.A., M.S., Ph.D. (Vanderbilt 1995, 2005, 2006) [2009]

CECELIA TICHI, William R. Kenan Jr. Professor of English
B.A. (Pennsylvania State 1964); M.A. (Johns Hopkins 1965); Ph.D. (California, Davis 1968) [1987]

JEFFREY S. TLUMAK, Associate Professor of Philosophy and Chair of the Department
B.A. (City University of New York, Brooklyn College 1969); M.A., Ph.D. (Massachusetts 1972, 1975) [1973]

NORMAN H. TOLK, Professor of Physics; Director, Center for Molecular and Atomic Studies at Surfaces; Professor of Radiology and Radiological Sciences
A.B. (Harvard 1960); Ph.D. (Columbia 1966) [1984]

ANDREW J. TOMARKEN, Associate Professor of Psychology and Chair of the Department, College of Arts and Science; Associate Professor of Biostatistics; Member, Vanderbilt Kennedy Center for Research on Human Development
A.B. (Harvard 1977); M.S., Ph.D. (Wisconsin 1982, 1988) [1989]

FRANK TONG, Associate Professor of Psychology, College of Arts and Science
B.S. (Queen's 1995); M.A., Ph.D. (Harvard 1998, 1999) [2004]

PATRICIA A. TRANGENSTEIN, Professor of Nursing; Assistant Professor of Biomedical Informatics
B.S.N. (Vanderbilt 1975); M.S.N. (Saint Louis 1979); Ph.D. (New York 1988); R.N. [2002]

BENIGNO TRIGO, Associate Professor of Spanish
B.A. (Amherst 1984); Ph.D. (Yale 1992) [2004]

GEORGENE L. TROSETH, Associate Professor of Psychology, Peabody College; Member, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Wyoming 1994); M.A., Ph.D. (Illinois 1997, 2000) [2000]

LORI TROXEL, Associate Professor of the Practice of Civil and Environmental Engineering
B.S. (Purdue 1984); M.S., Ph.D. (Vanderbilt 1990, 1994); P.E. [1997]

BARBARA TSAKIRGIS, Associate Professor of Classics; Chair of the Department of Classical Studies; Associate Professor of History of Art
B.A. (Yale 1976); M.A., Ph.D. (Princeton 1979, 1984) [1984]

STEVEN T. TSCHANTZ, Associate Professor of Mathematics
A.B., Ph.D. (California, Berkeley 1979, 1983) [1984]

CONSTANTINE TSINAKIS, Professor of Mathematics
B.S. (Thessalonika 1970); M.S. (Houston 1975); Ph.D. (California, Berkeley 1979) [1980]

ARLEEN M. TUCHMAN, Associate Professor of History
B.S. (Marlboro 1977); M.A., Ph.D. (Wisconsin 1980, 1984) [1986]

HOLLY A. TUCKER, Associate Professor of French
B.A. (Indiana 1989); M.A., Ph.D. (Wisconsin 1991, 1995) [1995]

TIFFINY A. TUNG, Assistant Professor of Anthropology
B.A. (California, Santa Barbara 1995); M.A., Ph.D. (North Carolina 1998, 2004) [2003]

WILLIAM L. TURNER, Betts Professor of Education and Human Development; Professor of Human and Organizational Development
B.A. (North Carolina 1985); M.A. (Abilene Christian 1987); Ph.D. (Virginia Polytechnic and State 1990) [2009]

MATTHEW JOHN TYSKA, Assistant Professor of Cell and Developmental Biology
B.S. (Notre Dame 1992); M.S. (Wyoming 1994); Ph.D. (Vermont 1999) [2004]

SAIT A. UMAR, Professor of Physics
B.S. (Bogazici [Turkey] 1979); M.Phil., M.S., Ph.D. (Yale 1985, 1985, 1985) [1986]

MARTINA URBAN, Assistant Professor of Religious Studies and Jewish Studies
M.A. (Freie Universität Berlin 1993); Ph.D. (Hebrew University of Jerusalem 2003) [2003]

DANIEL H. USNER, JR., Holland M. McTyeire Professor of History; Professor of History
B.A. (Johns Hopkins 1975); M.A., Ph.D. (Duke 1976, 1981) [2002]

JASON G. VALENTINE, Assistant Professor of Mechanical Engineering
B.S. (Purdue 2004); Ph.D. (California, Berkeley 2010) [2010]

WILLIAM M. VALENTINE, Associate Professor of Pathology; Investigator, Center for Molecular Neuroscience
B.A. (Lakeland 1976); B.S. (Illinois 1983); Ph.D. (Illinois, Chicago 1983); D.V.M. (Illinois 1985) [1995]

PATTI PARKISON VAN EYS, Assistant Professor of Psychiatry
B.A. (DePauw 1983); M.A., Ph.D. (Bowling Green State 1985, 1989) [1995]

R. LAWRENCE VAN HORN, Associate Professor of Management (Health Care)
B.A., M.P.H., M.B.A. (Rochester 1989, 1990, 1992); Ph.D. (Pennsylvania 1997) [2006]

LUC VAN KAER, Professor of Microbiology and Immunology
Ph.D. (Rijksuniversiteit Gent 1989) [1993]

KÁLMÁN VARGA, Assistant Professor of Physics
Diploma, Ph.D. (Debrecen [Hungary] 1989, 1996) [2005]

JEREMY M. VEENSTRA-VANDERWEELE, Assistant Professor of Psychiatry; Assistant Professor of Pediatrics; Assistant Professor of Pharmacology; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
A.B. (Harvard 1996); M.D. (Chicago 2001) [2006]

JULIA APOSTOLOVA VELKOVSKA, Assistant Professor of Physics
M.S. (Sofia University [Bulgaria] 1988); Ph.D. (SUNY, Stony Brook 1997) [2003]

INGRID M. A. VERHAMME, Research Assistant Professor of Pathology
B.S., M.S., Ph.D. (State University of Gent [Belgium] 1977, 1980, 1986) [1999]

BART VICTOR, Cal Turner Professor of Moral Leadership (Organization Studies)
A.B. (California, Berkeley 1977); M.S. (Bank Street College of Education 1979); Ph.D. (North Carolina 1985) [1999]

W. KIP VISCUSI, University Distinguished Professor of Law, Economics, and Management
A.B., M.P.P., A.M., Ph.D. (Harvard 1971, 1973, 1974, 1976) [2006]

TIMOTHY J. VOGUS, Assistant Professor of Management (Organization Studies)
B.A. (Michigan State 1995); M.L.I.R. (Cornell 1999); Ph.D. (Michigan 2004) [2004]

MICHAEL W. VOLLMAN, Assistant Professor of Nursing; Research Assistant Professor of Medicine; Assistant Professor of Psychiatry
B.S. (Trevecca Nazarene 1981); M.S.N., Ph.D. (Vanderbilt 1994, 2003); R.N. [1996]

BRIAN E. WADZINSKI, Associate Professor of Pharmacology; Investigator, Center for Molecular Neuroscience
B.S., Ph.D. (Wisconsin 1984, 1989) [1993]

CONRAD WAGNER, Professor of Biochemistry
M.S., Ph.D. (Michigan 1952, 1956) [1961]

LOIS J. WAGNER, Assistant Professor of Nursing
B.A. (Cincinnati 1972); B.S.N. (Catholic 1977); M.S.N. (Vanderbilt 1984); R.N. [1985]

TEDRA ANN WALDEN, Professor of Psychology, Peabody College; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Senior Fellow, Institute for Public Policy Studies
B.A., M.A., Ph.D. (Florida 1974, 1976, 1978) [1981]

GREG WALKER, Associate Professor of Mechanical Engineering; Associate Professor of Electrical Engineering
B.S., M.S. (Auburn 1990, 1993); Ph.D. (Virginia Polytechnic 1997) [1999]

LYNN S. WALKER, Professor of Pediatrics; Director, Division of Adolescent Medicine; Professor of Psychology, Peabody College; Professor of Psychology, College of Arts and Science; Investigator, Vanderbilt Kennedy Center for Research on Human Development
A.B. (Oberlin 1973); M.S., Ph.D. (Peabody 1978, 1981) [1982]

MARK THOMAS WALLACE, Professor of Hearing and Speech Sciences; Associate Professor of Psychology, College of Arts and Science; Professor of Psychiatry; Director, Vanderbilt Brain Institute; Member, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.A., M.A., Ph.D. (Temple 1986, 1987, 1990) [2005]

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
A.B. (Cornell 1964); M.A., Ph.D. (Connecticut 1965, 1968) [1971]

TAYLOR G. WANG, Centennial Professor of Mechanical Engineering, Emeritus; Centennial Professor of Materials Science and Engineering, Emeritus; Professor of Applied Physics, Emeritus
B.S., M.S., Ph.D. (California, Los Angeles 1967, 1968, 1971) [1988]

MARY KAY WASHINGTON, Professor of Pathology
B.S. (Mississippi State 1979); M.D. (North Carolina 1982) [1996]

DAVID H. WASSERMAN, Ronald E. Snato Professor of Diabetes Research; Professor of Molecular Physiology and Biophysics
B.S., M.S. (California, Los Angeles 1979, 1981); Ph.D. (Toronto 1985) [1985]

DAVID J. WASSERSTEIN, Eugene Greener Jr. Professor of Jewish Studies; Professor of History and Jewish Studies
B.A., M.A., Ph.D. (Oxford 1974, 1977, 1982) [2004]

MICHAEL R. WATERMAN, Natalie Overall Warren Distinguished Professor of Biochemistry and Chair of the Department
B.A. (Willamette 1961); Ph.D. (Oregon 1969) [1992]

FRANCIS W. WCISLO, Associate Professor of History; Dean of The Commons
A.B. (Michigan 1974); M.A., Ph.D. (Columbia 1977, 1984) [1984]

ALISSA M. WEAVER, Associate Professor of Cancer Biology; Assistant Professor of Pathology
B.S./B.A. (Stanford 1991); Ph.D., M.D. (Virginia 1997, 1998) [2003]

DONNA JANE WEBB, Assistant Professor of Biological Sciences; Assistant Professor of Cancer Biology; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.S. (James Madison 1989); Ph.D. (Virginia 1995) [2005]

GLENN F. WEBB, Professor of Mathematics
B.S. (Georgia Institute of Technology 1965); M.S., Ph.D. (Emory 1966, 1968) [1968]

WANDA G. WEBB, Assistant Professor of Speech (Language Pathology)
B.S. (Middle Tennessee State 1970); M.S. (Eastern Illinois 1971); Ph.D. (Vanderbilt 1979) [1978]

ROBERT J. WEBSTER III, Assistant Professor of Mechanical Engineering
B.S. (Clemson 2002); M.S., Ph.D. (Johns Hopkins 2004, 2007) [2008]

JOSEPH H. WEHBY, Associate Professor of Special Education; Member, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Memphis State 1982); M.Ed., Ph.D. (Vanderbilt 1987, 1990) [1990]

P. ANTHONY WEIL, Professor of Molecular Physiology and Biophysics
B.S. (Northern Illinois 1972); Ph.D. (Texas Health Science Center, Houston 1976) [1986]

THOMAS JOSEPH WEILER, Professor of Physics
B.S. (Stanford 1971); Ph.D. (Wisconsin 1976) [1984]

STUART TOBE WEINBERG, Assistant Professor of Biomedical Informatics; Assistant Professor of Pediatrics
B.S. (Dartmouth 1981); M.D. (Cincinnati 1985) [2004]

ELIZABETH E. WEINER, Senior Associate Dean for Informatics, School of Nursing; Professor of Nursing; Professor of Biomedical Informatics
B.S.N. (Kentucky 1975); M.S.N. (Cincinnati 1978); Ph.D. (Kentucky 1982); R.N. [2000]

MATTHEW BRET WEINGER, Norman Ty Smith Professor of Patient Safety and Medical Simulation; Professor of Anesthesiology; Professor of Biomedical Informatics
B.S., M.S. (Stanford 1978, 1978); M.D. (California 1982) [2004]

DAVID A. WEINTRAUB, Professor of Astronomy; Director, Science, Humanities, and Technology
B.S. (Yale 1980); M.S., Ph.D. (California, Los Angeles 1982, 1989) [1991]

BAHR WEISS, Associate Professor of Psychology, Peabody College; Member, Vanderbilt Kennedy Center for Research on Human Development; Co-Director, Center for Psychotherapy Research and Policy, Institute for Public Policy Studies
A.B. (Michigan 1974); Ph.D. (North Carolina 1988) [1988]

SHARON M. WEISS, Assistant Professor of Electrical Engineering; Assistant Professor of Physics
B.S., M.S., Ph.D. (Rochester 1999, 2001, 2005) [2005]

D. DON WELCH, JR., Associate Dean for Administration, Law School; Professor of Law; Professor of Religion
B.A. (Baylor 1969); M.A., Ph.D. (Vanderbilt 1975, 1976) [1984]

ROBERT A. WELLER, Professor of Electrical Engineering; Professor of Physics; Professor of Materials Science and Engineering
B.S. (Tennessee 1971); Ph.D. (California Institute of Technology 1978) [1987]

NANCY L. WELLS, Research Professor of Nursing; Director of Nursing Research, Vanderbilt University Medical Center
B.A., B.S.N. (Windsor 1976, 1976); M.N. (University of Washington 1981); D.N.Sc. (Boston University 1988); R.N. [1992]

QUAN WEN, Professor of Economics
B.Sc. (Jilin [China] 1985); M.A., Ph.D. (Western Ontario 1988, 1991) [2001]

SUSAN RAE WENTE, Professor of Cell and Developmental Biology and Chair of the Department; Associate Vice Chancellor for Research; Senior Associate Dean for Biomedical Sciences, School of Medicine
B.S. (Iowa 1984); Ph.D. (California, Berkeley 1988) [2002]

MEIKE G. J. WERNER, Associate Professor of German; Associate Professor of European Studies
M.A. (Washington University 1980); Staatsexamen (Tübingen [Germany] 1984); M.Phil., Ph.D. (Yale 1991, 1995) [1997]

STEVEN A. WERNKE, Assistant Professor of Anthropology
B.A. (Iowa 1992); M.A., Ph.D. (Wisconsin 1996, 2003) [2005]

DIANA N. WEYMARK, Assistant Professor of Economics
B.A., M.A. (Dalhousie 1978, 1980); Ph.D. (British Columbia 1990) [1999]

JOHN WEYMARK, Professor of Economics and Vice Chair of the Department
B.A. (British Columbia 1972); M.A., Ph.D. (Pennsylvania 1973, 1977) [1999]

ROBERT E. WHALEY, Valere Blair Potter Professor of Management (Finance)
B.Comm. (Alberta 1975); M.B.A., Ph.D. (Toronto 1976, 1978) [2006]

ROBERT H. WHITEHEAD, Research Professor of Medicine; Research Professor of Cell and Developmental Biology; Research Professor of Cancer Biology
B.Sc. (Queensland 1965); M.Sc. (Queensland [Australia] 1968); Ph.D. (Wales 1975) [1999]

BRONWEN L. WICKKISER, Assistant Professor of Classics
B.A. (Oberlin 1991); M.A., Ph.D. (Texas, Austin 1996, 2003) [2007]

JOHN P. WIKSWO, JR., Gordon A. Cain University Professor; A. B. Learned Professor of Living State Physics; Professor of Physics; Professor of Biomedical Engineering; Professor of Molecular Physiology and Biophysics
B.A. (Virginia 1970); M.S., Ph.D. (Stanford 1973, 1975) [1977]

RONALD G. WILEY, Professor of Neurology; Professor of Pharmacology; Investigator, Center for Molecular Neuroscience
B.S., M.D., Ph.D. (Northwestern 1972, 1975, 1975) [1982]

D. MITCHELL WILKES, Associate Professor of Electrical Engineering; Associate Professor of Computer Engineering
B.S.Eng. (Florida Atlantic 1981); M.S., Ph.D. (Georgia Institute of Technology 1984, 1987) [1987]

CHRISTOPHER S. WILLIAMS, Assistant Professor of Medicine; Assistant Professor of Cancer Biology
B.Sc. (Brigham Young 1992); Ph.D., M.D. (Vanderbilt 1999, 2002) [2006]

JOHN VANCE WILLIAMS, Assistant Professor of Pediatrics; Assistant Professor of Microbiology and Immunology
B.S. (Virginia 1990); M.D. (Medical College of Virginia 1994) [2003]

SCOTT MATTHEW WILLIAMS, Professor of Molecular Physiology and Biophysics; Associate Professor of Pediatrics; Adjunct Research Associate Professor of Medicine, Meharry Medical College
A.B. (Chicago 1976); Ph.D. (Washington University 1981) [1999]

RICHARD H. WILLIS, Ann Marie and Thomas B. Walker Jr. Associate Professor of Management (Accounting)
B.S. (South Alabama 1983); M.Stat. (Ohio State 1984); M.B.A. (Duke 1992); Ph.D. (Chicago 1998) [2006]

KEITH T. WILSON, Professor of Medicine; Professor of Cancer Biology
B.A. (Cornell 1982); M.D. (Harvard 1986) [2005]

DANNY G. WINDER, Associate Professor of Molecular Physiology and Biophysics; Investigator, Vanderbilt Kennedy Center for Research on Human Development; Investigator, Center for Molecular Neuroscience
B.S. (North Georgia College and State University 1990); Ph.D. (Emory 1995) [1999]

JAMES E. WITTIG, Associate Professor of Materials Science and Engineering; Associate Professor of Electrical Engineering
B.S. (Wisconsin, Milwaukee 1978); M.S., Ph.D. (Stanford 1980, 1985) [1987]

ARTHUR F. WITULSKI, Research Associate Professor of Electrical Engineering
B.S., M.S., Ph.D. (Colorado, Boulder 1981, 1986, 1988) [2006]

MARK WOLERY, Professor of Special Education and Chair of the Department; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Tennessee Temple 1969); M.Ed. (Virginia Commonwealth 1975); Ph.D. (University of Washington 1980) [2000]

MARK A. WOLLAEGER, Professor of English
A.B. (Stanford 1979); M.Phil., Ph.D. (Yale 1984, 1986) [1994]

DAVID CHARLES WOOD, Centennial Professor of Philosophy; Professor of Philosophy; Professor of European Studies
B.A. (Manchester [England] 1968); Ph.D. (Warwick 1985) [1994]

MYRNA HOLTZ WOODERS, Professor of Economics
B.A. (Alberta 1969); Ph.D. (Minnesota 1976) [2004]

GEOFFREY F. WOODMAN, Assistant Professor of Psychology, College of Arts and Science
B.S., Ph.D. (Iowa 1997, 2002) [2007]

CHRISTOPHER V. E. WRIGHT, Professor of Cell and Developmental Biology
B.Sc. (Warwick 1980); D.Phil. (Oxford 1984) [1990]

DAVID W. WRIGHT, Associate Professor of Chemistry; Associate Professor of Pediatrics
B.A., B.S. (Tulane 1988); Ph.D. (Massachusetts Institute of Technology 1993) [2001]

PETER F. WRIGHT, Adjunct Professor of Pediatrics
B.A. (Dartmouth 1964); M.D. (Harvard 1967) [1974]

EDWARD WRIGHT-RIOS, Assistant Professor of History
B.S. (Illinois 1987); M.A. (Vanderbilt 1998); Ph.D. (California, San Diego 2004) [2004]

JULIAN WUERTH, Associate Professor of Philosophy
B.A. (Chicago 1993); Ph.D. (Pennsylvania 2000) [2009]

DAOXING XIA, Professor of Mathematics
Undergraduate (Sangton 1950); Graduate (Jijian 1952) [1984]

FEN XIA, Assistant Professor of Radiation Oncology; Assistant Professor of Cancer Biology
M.Sc., M.D. (Suzhou Medical [China] 1986, 1983); Ph.D. (Harvard 1996) [2002]

BAOGANG JONATHAN XU, Assistant Professor of Neurological Surgery; Assistant Professor of Cancer Biology
B.S. (Lee 1999); Ph.D. (Vanderbilt 2005) [2005]

HUA XU, Assistant Professor of Biomedical Informatics
B.S. (Nanjing [China] 1998); M.S. (New Jersey Institute of Technology 2001); M.Phil., Ph.D. (Columbia 2007, 2008) [2008]

YAQIONG XU, Assistant Professor of Electrical Engineering; Assistant Professor of Physics
B.S. (Wuhan [China] 1997); Ph.D. (Institute of High Energy Physics [China] 2002); Ph.D. (Rice 2006) [2009]

YUAN XUE, Assistant Professor of Computer Science; Assistant Professor of Computer Engineering
B.S. (Harbin Institute of Technology [China] 1998); M.S., Ph.D. (Illinois 2002, 2005) [2005]

ELIZABETH YANG, Associate Professor of Pediatrics; Associate Professor of Cell and Developmental Biology; Associate Professor of Cancer Biology
A.B., M.S. (Chicago 1980, 1980); M.D., Ph.D. (Stanford 1987, 1987) [1997]

XIANGLI YANG, Assistant Professor of Medicine; Assistant Professor of Pharmacology
B.S. (Guangxi Normal 1982); M.S. (Mississippi State 1994); Ph.D. (Alabama, Birmingham 1999) [2006]

THOMAS E. YANKEELOV, Assistant Professor of Radiology and Radiological Sciences; Assistant Professor of Biomedical Engineering; Assistant Professor of Cancer Biology
B.A. (Louisville 1996); M.A., M.S. (Indiana University 1998, 2000); Ph.D. (SUNY, Stony Brook 2003) [2005]

WENDELL GRAY YARBROUGH, Associate Professor of Otolaryngology; Associate Professor of Cancer Biology
A.B., M.D. (North Carolina 1985, 1989) [2003]

PAUL J. YODER, Professor of Special Education; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.S. (Louisiana State 1978); M.S. (Peabody 1979); Ph.D. (North Carolina 1985) [1987]

JAMEY D. YOUNG, Assistant Professor of Chemical and Biomolecular Engineering; Assistant Professor of Molecular Physiology and Biophysics
B.S. (Kentucky 1999); Ph.D. (Purdue 2005) [2008]

PAMPEE PAUL YOUNG, Assistant Professor of Pathology; Assistant Professor of Medicine
B.A. (Rice 1990); Ph.D. (Texas, Southwestern Medical Center 1996); M.D. (Texas, Southwestern 1998) [2003]

PAUL YOUNG, Associate Professor of English; Associate Professor of Art; Director, Film Studies
B.A. (Iowa 1990); M.A., Ph.D. (Chicago 1992, 1998) [2003]

GUOLIANG YU, Professor of Mathematics
Ph.D. (SUNY, Stony Brook 1991) [2000]

FIONA ELIZABETH YULL, Assistant Professor of Cancer Biology
B.Sc. (Saint Andrews [Scotland] 1985); D.Phil. (Oxford [England] 1989) [1998]

ALEXANDER ZAIKA, Assistant Professor of Surgery; Assistant Professor of Cancer Biology
B.S., M.S. (Petersburg State 1983, 1986); Ph.D. (University of Chemical Technology 1995) [2005]

DAVID H. ZALD, Associate Professor of Psychology, College of Arts and Science; Associate Professor of Psychiatry; Investigator, Vanderbilt Kennedy Center for Research on Human Development
B.A. (Michigan 1989); Ph.D. (Minnesota 1997) [2000]

ANDRES ZAMORA, Associate Professor of Spanish; Associate Professor of European Studies
B.A. (Universidad Complutense de Madrid 1984); M.A. (Auburn 1986); Ph.D. (Southern California 1994) [1998]

ELIZABETH J. ZECHMEISTER, Associate Professor of Political Science; Assistant Director of the Latin American Public Opinion Project
B.A. (Loyola 1994); M.A. (Chicago 1996); Ph.D. (Duke 2003) [2008]

CHRISTOPH ZELLER, Assistant Professor of German
M.A., Dr. phil. (Stuttgart 1995, 1998) [2004]

ROY ZENT, Associate Professor of Medicine; Associate Professor of Cancer Biology; Associate Professor of Cell and Developmental Biology
M.B.,B.Ch. (Witwatersrand [South Africa] 1984); Ph.D. (Toronto 1997) [2000]

BING ZHANG, Assistant Professor of Biomedical Informatics
B.S., M.S. (Nanjing 1993, 1996); Ph.D. (Chinese Academy of Sciences 1999) [2006]

ZHONGMING ZHAO, Associate Professor of Biomedical Informatics; Associate Professor of Psychiatry; Associate Professor of Cancer Biology; Investigator, Center for Molecular Neuroscience
B.S. (Zhejiang [China] 1991); M.S. (Peking [China] 1996); M.D. (Texas, Houston 2000); M.S. (Houston 2002) [2009]

DECHAO ZHENG, Professor of Mathematics
B.S. (Chongqing [China] 1982); M.S. (Sichuan [China] 1985); Ph.D. (SUNY, Stony Brook 1992) [1996]

TAO PETER ZHONG, Assistant Professor of Medicine; Assistant Professor of Cell and Developmental Biology; Assistant Professor of Pharmacology
B.S. (Shanghai Medical 1987); Ph.D. (SUNY, Stony Brook 1995) [2001]

ANDRIES ZIJLSTRA, Assistant Professor of Pathology; Assistant Professor of Cancer Biology
B.S., Ph.D. (Washington State 1993, 1998) [2006]

SANDRA S. ZINKEL, Assistant Professor of Medicine; Assistant Professor of Cancer Biology; Assistant Professor of Cell and Developmental Biology
B.S. (Indiana University 1982); Ph.D. (Yale 1989); M.D. (Chicago 1995) [2005]

BENJAMIN C. ZISSIMOS, Assistant Professor of Economics
B.Sc. (London School of Economics and Political Science 1992); M.Sc., Ph.D. (Warwick [England] 1993, 2003) [2003]

ISLEIDE R. M. ZISSIMOS, Adjunct Assistant Professor of Economics
B.Sc.Econ., M.Sc.Econ., Ph.D. (Universidade Federal do Rio de Janiero [Brazil] 1998, 2002, 2007) [2008]

MARY M. ZUTTER, Professor of Pathology; Professor of Cancer Biology; Director, Division of Hematopathology; Ingram Professor of Cancer Research
B.S., M.D. (Tulane 1976, 1981) [2003]

LAURENCE J. ZWIEBEL, Professor of Biological Sciences; Professor of Pharmacology; Investigator, Center for Molecular Neuroscience
B.S. (SUNY, Stony Brook 1980); M.S. (Michigan 1982); Ph.D. (Brandeis 1992) [1997]

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